Savannah River Site

Risk-Based End State Vision

Draft: March 30, 2004

04N01314-KP

United States Department of Energy
Savannah River Site

RISK-BASED END STATE VISION

Westinghouse Savannah River Company LLC
Savannah River Site
Aiken, SC 29808

WSRC-MS-2004-00021
DRAFT
March 30, 2004

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ACRONYM LIST

ACL -- Alternate Concentration Limits/
Am/Cm -- Americium/Curium
BGC – Burial Ground Complex
CAB – Citizens Advisory Board
CCP – Comprehensive Cleanup Plan
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFL – Comprehensive Facility List
CIF – Consolidated Incineration Facility
CLAB – Central Laboratory Facility
CMPC -- classified matter protection and control
CRESP – Consortium of Risk Evaluation with Stakeholder Participation
CRMP – Cultural Resources Management Plan
CSM – Conceptual Site Model
CSRA – Central Savannah River Area
CSWTF – Central Sanitary Wastewater Treatment Facility
D&D – Deactivation and Decommissioning
DNFSB -- Defense Nuclear Facilities Safety Board
DOE – Department of Energy
DOE-HQ – Department of Energy-Headquarters
DOE-SR – Department of Energy-Savannah River Operations Office
DU – Depleted Uranium
DUO -- depleted uranium trioxide powder
DUN – Depleted Uranyl Nitrate
DWPF – Defense Waste Processing Facility
EE/CA – Engineering Evaluation/Cost Analysis
EIS – Environmental Impact Statement
EM – Environmental Management
EPA – Environmental Protection Agency
ESS – Essential Site Services
ETF – Effluent Treatment Facility
FERE – Federal Energy Regulatory Commission
FFA – Federal Facilities Agreement
FL -- Office of Future Remediation and Waste Management Liabilities
FML – flexible membrane liner
FR – Federal Register
FTF – F-Tank Farm
G&A – General and Administrative
gpm – gallons per minute
GSA OU -- General Separations Area Consolidation Unit
GWSB – Glass Waste Storage Building
HATF -- High Activity TRU Facility
HEU – Highly Enriched Uranium
HLW – High Level Waste
HTF – H-Tank Farm
HVAC -- Heating, ventilation and air-condition
HW – Heavy Water
HWCTR -- Heavy Water Components Test Reactor
IC – Institutional Controls
IOU – Integrator Operable Unit
IPABS -- Integrated Planning Accountability and Budgeting System
ISD -- In-Situ Disposal
KAMS -- K-Area Material Storage Facility Project
kV – kilo volt
LEU –Low Enriched Uranium
LLRWDF-- Low-Level Radioactive Waste Disposal Facility
LLMS – Low Level Mixed Waste
LLW – Low-Level Waste
LTS – Long Term Stewardship
LUC – Land Use Controls
LUCAP -- Land Use Control Assurance Plan
MCL -- maximum contaminant limits
Mk -- Mark
MNA -- Monitored Natural Attenuation
MOA – Memorandum of Agreement
MOX – Mixed Oxide
MPF – Modern Pit Facility
MW – Mixed Waste
MWMF -- Mixed Waste Management Facility
MZCL -- Mixing Zone Concentration Limits
NDAA -- National Defense Authorization Act
NEPA – National Environmental Policy Act
NERP – National Environmental Research Park
NMM – Nuclear Materials Management
NNSA – National Nuclear Security Administration
NNSA-DP – National Nuclear Security Administration – Defense Programs
NNSA-NN – National Nuclear Security Administration-Nuclear Nonproliferation
NPDES – National Pollutant Discharge Elimination System
NPL – National Priority List
NRC – Nuclear Regulatory Commission
NRHP – National Register of Historic Places
NTS – Nevada Test Site
ORWBG -- Old Radioactive Waste Burial Ground
OSWER -- Office of Solid Waste and Emergency Response
PAR -- Probabilistic Risk Assessment
PCBs - polychlorinated biphenyls

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PDCF -- Pit Disassembly and Conversion Facility
PMP—Performance Management Plan
Pu – Plutonium
PUREX -- Plutonium/Uranium Extraction
RAO—Remedial Action Objective
RBES – Risk Based End State
RBOF – Receiving Basin for Offsite Fuels
RCRA – Resource Conservation and Recovery Act
ROD – Record of Decision
ROM – Rough Order of Magnitude
RSM -- Ranking and Sequencing Model
RW -- Office of Civilian Radioactive Waste Management
S&M – Surveillance and Maintenance
S&S – Safeguards and Security
S/S – Stabilization/Solidification
SAR – Safety Analysis Report
SCDHEC – South Carolina Department of Health and Environmental Control
SCE&G -- South Carolina Electric and Gas
SEURR -- Southeast Universities Research Reactor
SFAS
SGP – Soils and Groundwater Project
SNF – Spent Nuclear Fuel
SNM – Special Nuclear Materials
SRARP – Savannah River Archaeological Research Program
SREL – Savannah River Ecology Laboratory
SRS -- Savannah River Site
SRTC – Savannah River Technology Center
SVOC – Semi-Volatile Organic Compound
SW – Solid Waste
SWMF – Solid Waste Management Facility
SWPF -- Salt Waste Processing Facility
TEF – Tritium Extraction Facility
TRU – Transuranic Waste
TSF – Treatment and Storage Facility'
TVA – Tennessee Valley Authority
UCNI -- unclassified controlled nuclear information
USFS – United States Forestry Service at Savannah River Site
VE – Visual Examination
VOCs -- volatile organic compounds
WIPP – Waste Isolation Pilot Plant
WIR – Waste Incidental to Reprocessing
WOW – Waste on Wheels
WSI – Wackenhut Services, Inc.
WSRC – Westinghouse Savannah River Company

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EXECUTIVE SUMMARY

Background and General Site Description

During the early 1950s the Savannah River Site (SRS) began to produce materials used in nuclear weapons, primarily tritium and plutonium-239. Five reactors were built to produce these materials. Also built were supporting facilities including two chemical separations plants, a heavy water extraction plant, a nuclear fuel and target fabrication facility a tritium extraction facility and waste management facilities. After 40 years of producing nuclear materials for defense and non-defense uses, the SRS shifted its strategic direction and resources from nuclear weapons production to cleanup of the nuclear waste and environmental contamination created during production.

Today the SRS is a key Department of Energy (DOE) industrial complex dedicated to environmental management accelerated cleanup, providing capability for supporting the enduring nuclear weapons stockpile and processing and storing nuclear materials in support of the U.S. nuclear non-proliferation efforts. The site also develops and deploys technologies to support the accelerated cleanup and is designated as a National Environmental Research Park (NERP).

Environmental Management (EM) and National Nuclear Security Administration (NNSA) are the primary DOE programs and missions being carried out at SRS. SRS's FY04 budget is approximately $1.7 billion with approximately 80% dedicated to the EM Cleanup project, 18 % to NNSA and the remaining 2% to other DOE and federal programs.

The SRS complex covers 198,344 acres, or 310 square miles with industrial operation facilities (active and inactive) occupying less than 10% of the total area. It encompasses parts of Aiken, Barnwell and Allendale Counties in South Carolina and borders the Savannah River.

The site is owned by DOE and operated by an integrated team led by Westinghouse Savannah River Company, LLC (WSRC) a subsidiary of Washington Group International's Energy and Environment Operations. The contract[7] that went into effect October 1, 1996, is in effect through December 31, 2006. It was revised June 18, 2003, to provide significant modifications to accelerate the near-term schedule of the EM Cleanup project beyond the EM Program Performance Management Plan (PMP) that was issued August 7, 2002. The SRS EM Program PMP is considered to be the SRS EM Cleanup project baseline. The WSRC contract scope is primarily responsible for DOE missions for EM, NNSA Defense Programs and NNSA Non-Nuclear Proliferation Programs. This also includes the Savannah River Technology Center (SRTC), and the site's administrative and landlord functions that are under EM responsibility at SRS.

Other major DOE contractors at SRS include Wackenhut Services Inc. (WSI) for security services and the University Of Georgia, which operates the Savannah River Ecology Laboratory (SREL). The DOE is also responsible for natural resources management under terms of an interagency agreement with the U. S. Forestry Service.

End State Vision Summary

The **Savannah River Site (SRS) "began with the end in mind"** during the early stages (mid 1990s) of the SRS cleanup program. Collaboratively working with SRS stakeholders and regulators, the SRS developed the *SRS Future Land Use Report* and confirmed this future use in the 1998 *DOE Future Use Report to Congress*. In this report, the DOE made significant declarations and confirmations of future land use end states that are the basis for risk assessment and soil cleanup to industrial (not residential) use.

The End State Vision

The vast majority of SRS legacy hazards will be removed from the site, particularly the EM legacy nuclear material and nuclear waste hazards. With the removal and off-site disposition of EM nuclear material and waste hazards, the remaining hazards at SRS will be orders of magnitude less than the current hazards. Any residual hazards to onsite and offsite receptors will be significantly reduced to an acceptable risk level that is protective of onsite and offsite potential receptors and consistent with environmental laws and regulations

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The SRS EM Cleanup project and resulting SRS Risk Based End State (RBES) Vision is to permanently disposition all EM nuclear material and waste hazards, decommission all EM facilities and remediate all SRS inactive waste units. The vast majority of EM nuclear material and waste hazards will be permanently removed from SRS and dispositioned offsite. Inactive waste units will be remediated by deploying an area-by-area closure and deletion strategy. Concurrently with area closure, all EM facilities will be decommissioned unless reused to support other long-range federal missions at SRS. Inactive waste units will be deleted from the National Priorities List (NPL) of Superfund sites.

By 2025, all inactive waste sites that pose a risk to surface water or groundwater will be remediated and any contaminated groundwater supplies will be remediated or undergoing remediation. Units that leave waste in place will be under institutional controls that feature an inspection, maintenance, and monitoring program with access restrictions.

The SRS End State Vision is:

- SRS land will be federally owned, controlled and maintained in perpetuity as established by Congress.
- EM Cleanup project and mission will be complete by 2025 and ongoing NNSA nuclear industrial missions will continue. SRS is a site with an enduring mission and is not a closure site.
- EM Cleanup will be complete consistent with SRS Future Land Use:
    - EM nuclear materials will be removed from SRS and dispositioned offsite.
    - Waste (high level, transuranic, mixed and hazardous) will be removed from SRS and dispositioned offsite except for the waste facilities closed and monitored in accordance with the FFA and RCRA permit.
    - All SRS inactive waste units will be remediated and deleted (or proposed for deletion) from the National Priorities List (NPL) of Superfund sites and institutional controls will be in place to ensure access to completed waste units is limited.
    - All EM facilities will be permanently decommissioned by demolition or in situ disposal unless reused by another federal program.
    - Low level waste will be disposed on site in accordance with the Atomic Energy Act and DOE Order 435.1 Radioactive Waste Management.
    - Facilities associated with NNSA missions in F and H Areas, supporting waste management and essential site infrastructure are anticipated to remain active and appropriately sized to support ongoing missions.

This End State Vision directly supports the Environment and Defense Strategic Goals in the Department of Energy (DOE) Strategic Plan[2].

The RBES Vision Purpose

The *purpose* of the SRS RBES Vision is to ensure cleanup is focused and achieves, clearly defined, mutually agreed-upon and technically defensible risk-based end states that are protective and sustainable, and reflect the planned future use of the property. The Vision *goal* is to improve the effectiveness and accelerate the cleanup process.

Key Features

- SRS has demonstrated positive results and success by employing “risk balancing” methods.
- Strong stakeholder support and collaborative regulator working relationships are cornerstones of SR’s current and future success. Regulators and the public already agree with DOE SR’s EM End State as stated in the PMP and SRS Future Land Use. (Ref: 1995 CAB Future Land Use Recommendation #8, Regulator Letter Of Support and July 2003 MOA in Support of Accelerated Cleanup)
- Partnering with science – SRTC, SREL, the Consortium of Risk Evaluation and Stakeholder Participation (CRESP) and National Academy of Sciences.
- Graded approach to RBES data requirements.

SRS Mission Summary: Current and Planned Missions

The SRS Cleanup project mission and goal is to complete the cleanup by 2025 and transition SRS to a site focused on national security[1]. SRS will accommodate the ongoing National Nuclear Security Administration (NNSA) missions before and beyond 2025. SRS is not a DOE closure site.

Environmental Management

The *EM Program Performance Management Plan*[8] (PMP) is the SRS baseline for the EM accelerated cleanup mission. The SRS EM cleanup program involves completing the removal of waste from all high-level waste tanks and closing all the tanks; completing nuclear materials stabilization and processing in the canyons and separations facilities; consolidating and dispositioning spent nuclear fuel; treating and disposing of solid wastes; remediating contaminated groundwater and soil; and deactivating and decommissioning EM facilities. This Vision provides a mission plan and area end state update that reflects any changes resulting from the June 2003 DOE-SR Contract Modification and EM Life Cycle Baseline Required Program Guidance[9].

National Nuclear Security Administration

In support of the DOE's NNSA Defense Program missions, SRS has been designated to continue as DOE's center for the tritium supply to the enduring nuclear weapons stockpile. The primary new source of tritium will be an existing commercial reactor in the Tennessee Valley Authority system. Tritium extraction from targets and loading into containers for shipment to the Department of Defense will continue to be a SRS long term mission beyond 2025.

In support of the DOE's NNSA Nuclear Non-Proliferation missions, SRS has been selected to "blend down" weapons usable highly enriched uranium fuel (irradiated and unirradiated) to low-enriched uranium that can be converted to reactor fuel suitable for commercial nuclear power reactors.

Additionally, in January 2000, the Secretary of Energy announced that SRS will be the location for the DOE's facilities to disposition 34 metric tons of surplus weapons grade plutonium as mixed oxide (MOX) fuel to be irradiated in commercial nuclear reactors. The MOX conversion process is expected to cost $3.8 billion over 20 years. The current schedule would build, operate and complete its current mission before 2025; however, this program could be delayed due to the international nature of the national security, non-proliferation mission.

Regional Land Use – Current and End State

The current regional land use surrounding SRS is primarily forestry and agricultural with secondary use by industry and government operations, light residential and recreation. The forestry and agricultural surrounding land use is not expected to change appreciably by 2025.

Savannah River Site Land Use – Current and End State

The current SRS Land Use Plan assumes that the entire site will be owned and controlled by the federal government in perpetuity and used for industrial purposes for future DOE and non-DOE missions. Site boundaries will remain unchanged. Residential use will not be allowed onsite. Offsite repositories will be available for high level, transuranic, hazardous and mixed waste.

The current Future Land Use Plan concentrates future industrial land use operations toward the center of the site to form a central core with continuing national security missions.

The End State vision proposes the same SRS land use except where industrial operations are not planned.

Hazards, Risks and Receptors – Current And End State

All SRS hazards can be summarized in five major categories:

- **Nuclear Materials**: Plutonium, Uranium, Spent Nuclear Fuel (SNF), Tritium and other miscellaneous nuclear materials.
- **Radiological Waste:** High Level Waste (HLW), Transuranic (TRU), Low Level Waste (LLW) and Low Level Mixed Waste (LLMW).
- **Non-Radiological Waste** Hazardous and Sanitary

- **Inactive Waste Units:** Soil and Groundwater
- **EM Facilities**: Nuclear, Radiological, Other Industrial and High Level Waste Tanks

Chapter 1 provides a summary of current and end state hazards and risks. Chapter 4 further describes the current and end state hazards and risks with a focus on soil, groundwater and EM facilities. The Conceptual Site Models in Appendices B, C and D communicate the human and ecological receptors.

Variance Summary, Enablers and Recommended Congressional Action

SRS has identified five variances. For the purposes of this document, **a variance is defined as a significantly different cleanup approach or different end state relative to the original SRS EM PMP.**

It is important to note that the proposed variances and recommendations are considered to be "enablers" to accomplish the EM Cleanup project by 2025 within the desired out year funding targets. Currently the SRS EM life cycle baseline (technical scope, cost and schedule) is in the process of validation. After baseline validation, the variances will be reassessed for changes to the EM Cleanup project baseline.

The following Variances are submitted for consideration. Variances with associated implementation recommendations are included in Appendix E.

- Future Land Use and Exposure Scenario Modification
- Area Risk Methodology and Protocols
  - Area-wide Multimedia Environmental Model (Alternative Project) and Deactivation Risk Assessment Accelerated Closure
- Alternate Disposal for Pu-238 Contaminated Waste
- In Situ Decommissioning in lieu of Demolition
- Revise "glass durability" Waste Acceptance Criteria for the high level waste federal repository

Barriers to RBES Vision Success

High Level Waste classification is overwhelmingly the single largest barrier to the accelerated cleanup program. The issue is: "Can incidental amounts of high level waste be reclassified for near surface disposal (similar to the two closed HLW tanks at SRS) if risk to environment and public are protective."

Other significant barriers to SRS mission planning and accelerating cleanup are:

- Final decision for DOE nuclear material consolidation strategy and disposition paths.
- Load management of TRU waste
- Early initiation of SNF drying, poisoning and packaging facility to meet the 2011 initial shipping date to the Yucca Mountain Federal Repository.
- Early initiation of transportation load out facilities for SNF and HLW.

Recommended Congressional Action To Accelerate Cleanup

SRS recommends formal Congressional Authorization to provide perpetual federal ownership and responsibility for SRS's fixed boundaries.

References:

1. *Definition of Environmental Management Completion, Jessie Roberson to EM Field Office Managers*, February 12, 2003.
2. *DOE Strategic Plan, Protecting National, Energy, and Economic Security with Advanced Science and Technology and Ensuring Environmental Cleanup* September 30, 2003
3. *SRS Long Range Comprehensive Plan*, Dec., 2000, John Pescosolido
4. *SRS Citizen's Advisory Board Recommendation No. 8, Future Land Use,* September 26, 1995.
5. Report, *SRS Future Use Project Report*, Jan., 1996, Memo, Mario P Fiori to Thomas P. Grumbly (EM-1)
6. *DOE Report to Congress: Planning For The Future, An Overview Of Future Use Plans*

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At Department Of Energy Sites, October 7, 199

7. SR and SRSO Performance Evaluation and Measurement Plan for WSRC LLC Contract No. DE-AC09-96SR185000, Modification No. M100, June 18, 2003.
8. *SRS Environmental Management Program Performance Management Plan* (EM-PMP), August 7, 2002.
9. *Environmental Management Life Cycle Baseline – Required Program Guidance*, J. M. Allison to R. A. Pedde, 9-16-03.

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1. 0 Introduction

1.1 Organization of the Report

The *Savannah River Site* (*SRS) RBES Vision* was developed according to Department of Energy (DOE) Policy 455.1, *Use of Risk-Based End States*, the *DOE RBES Vision Guidance*, and the *DOE RBES Guidance Clarification*. The report organizational format and structure is according to that requested in the guidance. The *SRS RBES Vision* is issued in two volumes.

The SRS RBES Vision addresses all SRS current hazards and hazard end states with an emphasis on inactive waste units for soil and groundwater and DOE's Environmental Management (EM) facilities.

Chapter 1 discusses SRS background, hazards and risks, cleanup goals and strategy, site missions and planning assumptions. Chapter 2 addresses the SRS in a regional context by explaining the region surrounding SRS. Chapter 3 provides site-specific information on the physical and surface interface, land use and ownership and site demographics. Chapter 4 provides additional details on the watersheds and site areas.

Maps, conceptual site models (CSMs) and detailed hazard tables are integrated and holistically support one another. They are organized in Appendices A through D. Appendices B through D are in 11 inches by 17 inches format for readability and are issued as a supporting Volume 2. Variances and recommendations are included in Appendix E. Other appendices are included for pertinent related information and support the *RBES Vision* and long term stewardship after the EM project at SRS is complete. These include appendices on regional planning initiatives, copies of regulatory agreements, long term stewardship, and references used in this *RBES Vision*.

The *SRS RBES Vision* fully meets the intent of the guidance; however, a graded approach has been implemented to meet the data requirements for the RBES Vision. Hazards and risks are identified individually and depicted in the following hierarchy:

1. Site
2. Watershed/Integrator Operable Unit (IOU) (see IOU definition Chapter 4, page 1)
3. Area

This supports the SRS area closure approach that has been agreed to with the SRS regulators. In addition to the site and watershed views, the hazards are depicted on an area by area basis to align with site mission planning and future land use. Both the IOU-watershed and area perspectives are supported by associated maps, CSMs and hazard tables.

In Appendices B and C, all SRS hazards for soil and groundwater provide a current cleanup status and current estimated human health risk range and are mapped to its respective hazard type. For individual soil and groundwater hazards where remediation is complete, the remediation action(s) and institutional controls (if required) are noted. For EM Facilities, the current status, risk type and planned EM decommissioning end state are provided. It is important to note that the *Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan* (WSRC-RP-2003-00233) establishes a decommissioning method without consideration of any programmatic reuse. The *EM Performance Management Plan* (PMP) does assume a degree of programmatic reuse until such time that long-range federal mission plans for SRS are established to enable support and infrastructure "right sizing." Infrastructure "right sizing" is being developed as part of the strategic planning and analysis activities.

Appendix D Conceptual Site Models for Typical Hazards breaks down the SRS hazards for soil, groundwater and EM Facilities into typical hazard types, with associated typical pathways and receptors and associated typical remedial actions and technologies.

1.2 SRS Background

During the early 1950s SRS began to produce materials used in nuclear weapons, primarily tritium and plutonium-239. Five reactors were built to produce these materials. Also built were supporting facilities including two chemical separations plants, a heavy water extraction plant, a nuclear fuel and target fabrication facility, a tritium extraction facility and waste management facilities. After 40 years of producing nuclear materials for defense and non-defense uses, the SRS shifted its strategic direction and resources from nuclear weapons production to cleanup of the nuclear waste and environmental contamination created during production. The start of the SRS cleanup operations began in 1981 when the site began inventorying waste units. The site has identified 515 inactive waste and groundwater units. Waste units range in size from a few feet to tens of acres and include basins, pits, piles, burial grounds, landfills, tanks, and associated groundwater contamination. Remediation of the waste sites is regulated under the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

In August 1993 DOE, the Environmental Protection Agency (EPA), and the South Carolina Department of Health and Environmental Control (SCDHEC) reached agreement on the cleanup of SRS and signed the *Federal Facility Agreement* (FFA).

The major purpose of the FFA is to ensure that the environmental impacts associated with past and present activities are investigated and that appropriate corrective/remedial action is taken as necessary to protect the public and the environment. Appendices to the FFA specify the work to be done in any particular year and these appendices are negotiated annually with all three parties.

In the early stages, (mid 1990s) of the SRS cleanup program, ***"SRS began with the end in mind"*** by developing the *SRS Future Land Use Report* with SRS stakeholders and regulators and confirming this future use in a report to Congress.

Initially, residential cleanup standards were considered, but in 1995 the Citizens Advisory Board (CAB) issued Recommendation Number 8 on SRS future use. In this recommendation, the CAB recommended a future use for SRS that included the following:

- SRS boundaries should remain unchanged and SRS should remain under the ownership of the federal government.
- Multiple uses of the land should be considered including industrial zones.
- Residential uses of SRS should be prohibited.
- Future use planning should consider the full range of worker, public and environmental risks, benefits, and costs.

This recommendation led to the development of the *SRS Future Use Project Report*, which provided additional details to the CAB recommendation and included similar comments from other stakeholders. In this report DOE made significant declarations and confirmations of land use, including:

- Site boundaries are to be fixed and will remain under federal government ownership.
- Residential uses will be prohibited.

Under the CERCLA process, these declarations enabled the regulatory remedy decision and implementation process for the SRS hazards associated with cleanup of soil to industrial land use standards as the basis for cleanup decisions and eliminated a requirement to cleanup to residential land use levels. Groundwater unit cleanup requirements are based on Maximum Contaminant Levels (MCLs) which are established by the Environmental Protection Agency (EPA) under the authority of the Safe Drinking Water Act. The South Carolina groundwater policy and goal is to "maintain or restore groundwater quality so it is suitable as a drinking water source without any treatment" (*SC Reg. R61-68 Water Qualifications and Standards*). All groundwater is classified as potable and is required to meet MCLs as a cleanup goal.

In 1998 the site issued the *Future Use Plan*, which established a planning baseline and an aid to SRS management in making future-use decisions, based on CAB Recommendation 8. This plan analyzed several different planning models for the future use of the site and recommended the Integral Site Model. This model would accommodate current missions and those of the future, maintain buffer zones, and allow for research, natural resource management, biological diversity and cultural maintenance of the site. This would be accomplished by dividing the site into three principal planning zones: Industrial, Industrial Support, and Restricted Public Use.

In September 1999, the Secretary of Energy signed the *Statement of Principles* with governors of various states that contain DOE sites, including the Governor of South Carolina. This document laid the foundation for a cooperative relationship between DOE and these states. The *Statement of Principles* outlined issues common to all states as well as issues specific to each state and delineated the manner in which DOE and the states can work cooperatively to clean up DOE weapons sites.

Common issues included such items as completing the cleanup of the nuclear weapons legacy as expeditiously as possible in compliance with state and federal regulations; obtaining a commitment to predictable and adequate funding for the cleanup;

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continuing investments in science and technology; and protecting groundwater. Specific issues common to both DOE and the State of South Carolina included the schedule for shipping transuranic waste out of the state; ensuring SRS cleanup; final disposition for high-level, low-level, and mixed low-level wastes; a plan for use and closure of the SRS canyons; assurance that SRS is treated equitably; and plans to request adequate funding for current and future missions. These principles formed the foundation for a cooperative, continuing dialogue between the DOE and the states to address long-term funding and stewardship issues

In 2002, the Office of Environmental Management (EM) of DOE published an internal review of the EM program The *Top-to-Bottom Review of the EM Program*, identified several challenges facing DOE-EM, revealed by cost and schedule estimates determined by the independent review team. Later that same year, EM established a set of corporate projects to lead EM's response to these challenges. These projects are intended to change the way EM, and in some cases, DOE, conducts business.

In August 2002 the *Savannah River Site Environmental Management Program Performance Management Plan* (PMP) was issued. This plan describes the approach to be taken to achieve an accelerated cleanup of SRS.

In July 2003 a Memorandum of Agreement (MOA) was signed by DOE, EPA, and SCDHEC in which the parties agreed to support accelerated cleanup of SRS. To accomplish this, they determined that the principle of area closure would be the implementing method. This principal of area closure includes the remediation of inactive waste units and the decommissioning of EM facilities and will determine that areas are completed when all required response actions are completed. As an area is completed, the parties endorse the application for partial deletion of the respective area from the National Priorities List (NPL). The goal is to delete all areas of the SRS from the NPL.

The parties agree that the concept of Area Records of Decision (RODs) is an appropriate tool for the resequencing of the FFA program to support area closure as the accelerated end date is being achieved. To the maximum extent practicable, entire areas of the SRS (e.g., a facility area such as TNX) will be addressed as a consolidated unit to take advantage of characterization data, risk assessment, and integrated solutions that consolidate areas into an expanded operable unit to effect economies of scale and reduce administrative requirements.

In the MOA, the parties committed to work together to develop the *Comprehensive Cleanup Plan* (CCP) to achieve an earlier end date for the environmental restoration and facility decommissioning at SRS. This plan was completed in September 2003 and represents an accelerated cleanup program that has a clear objective to reduce risks to workers, the public and the environment. This plan supplements and communicates the integration and sequencing of Soils and Groundwater Projects and Deactivation and Decommissioning Projects in an area-by-area closure concept. For the purposes of the environmental restoration program, the CCP will become the background to the *Federal Facility Agreement* (FFA) Appendices D and E.

Beginning in late 2002 and continuing into 2003, DOE re-negotiated its contract with the Westinghouse Savannah River Company (WSRC) to further acceleration of cleanup and other activities at SRS. In this modification, WSRC is paid for work accomplished and is provided with incentives to accelerate and accomplish additional cleanup work.

In February 2004, as a result of the contract modification, the FFA Appendix E, (Out Year Milestone commitments) was modified to align the SRS enforceable agreement with the Area Closure strategy.

1.3 Site Hazards and Risk

1.3.1 Hazard and Risk Relationship

Risk is the chance of harm or loss. In the cleanup context, environmental laws are designed to protect humans and the environment from hazards and restore the environment to ensure human and ecological health are within an acceptable risk range. For a risk to exist, a hazard must be present and there must be an exposure pathway to a receptor. Risk assessment is a function of the type of land use, who is exposed (what kind of receptor) and how the receptor is exposed (pathway).

Since there is no such thing as "zero risk," Congress has defined the acceptable level of risk for cleanup of hazards. For chemicals that produce cancer (carcinogens), the residual hazard is limited to an excess lifetime cancer risk (ELCR) within 1 to 100 in

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a million. This is sometimes expressed as a risk range of "$10E^{-4}$ to $10E^{-6}$." If the residual risk is $10E^{-6}$, then for every 1,000,000 people that could be exposed, one extra cancer case may occur as a result of exposure to the contaminated hazard site. One extra cancer case means that one more person could get cancer than would normally be expected from all other causes. For $10E^{-4}$ risk, then there may be one extra cancer cases may occur for every 10,000 people exposed to the hazard site.

Nuclear material and waste hazards have controls in place to contain and disposition the hazards to avoid an event that would allow a hazard exposure pathway to a receptor which could adversely impact human health or the environment. Controls are determined by assessing and characterizing the hazard and analyzing potential accident scenarios and associated consequences (through various risk assessment processes (Performance Risk Assessments and Safety Analysis Reports).

For inactive waste unit hazards (surface and groundwater units) and EM Facilities, the adverse event has already occurred and cleanup is required to reduce the risk to legally acceptable levels.

1.3.2 Site Hazard Categories

All SRS hazards can be summarized in five major categories:

- **Nuclear Materials:** plutonium, uranium, spent nuclear fuel, tritium and other miscellaneous nuclear materials.
- **Radiological Waste:** High Level Waste (HLW), Transuranic (TRU) waste, Low Level Waste (LLW) and Low-Level Mixed Waste (LLMW).
- **Non-Radiological Waste:** hazardous and sanitary waste
- **Inactive Waste Units:** contaminated soil and groundwater
- **EM Facilities**: nuclear, radiological, other industrial and high level waste tanks

Table 1.1 depicts a site summary of SRS Hazards, Current Cleanup Status, End State and Final Disposition. Table 1.2, Gold Metrics, provides a list of EM performance metrics being tracked by DOE to measure progress towards accomplishing final end states for certain nuclear materials, wastes, inactive waste units, and EM facilities.

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Table 1.1 SRS Hazards, Current Status and End State

Hazard Category	Current Status	End State and Final Disposition
Nuclear Materials		
Pu	Plutonium Nuclear Materials are being stabilized, interim stored if necessary, and dispositioned.	Plutonium will be removed from SRS via MOX fuel fabrication, processed through the Canyon and associated B-Line facility or to a Federal Repository.
U (HEU & DU)	Uranium Nuclear Materials are being stabilized, interim stored if necessary, and dispositioned Off-Site.	Uranium will be dispositioned offsite via commercial vendors, processed through the Canyon, or dispositioned to a Federal Repository.
Spent Nuclear Fuel	All of DOE's SNF receipts are stored at SRS in 105 L Reactor Facility. All SNF at SRS is consolidated in single storage at 105 L Reactor facility.	All SNF will be shipped Off Site for final disposal at Yucca federal repository.
Miscellaneous	Interim storage pending Off-Site transfer or disposal.	Off site transfer or disposal.
Tritium	Ongoing mission to extract new tritium and recycle stockpile tritium.	Ongoing mission to extract new tritium and recycle stockpile tritium.
Waste - Radiological		
HLW	Approximately 37 million gallons (~420 million curies) stored in 49 underground storage tanks. Tailored Salt disposition approach on hold pending WIR lawsuit resolution.	All HLW will be shipped Off Site for final disposal at Yucca federal repository.
TRU	TRU waste is in interim storage and is being shipped off site to WIPP for permanent disposal. Over 10,000 drums have been shipped.	All SRS TRU waste (and any Mixed TRU) will be shipped Off Site to WIPP federal repository for permanent disposal.
LLW	All new LLW is disposed in Solid Waste Management Facilities (SWMF).	Low level waste will be disposed on site in accordance with the Atomic Energy Act and DOE Order 435.1 Radioactive Waste Management.

Table 1.1 SRS Hazards, Current Status and End State

Hazard Category	Current Status	End State and Final Disposition
Mixed Waste (Low Level Mixed Waste)	New MW is interim stored on site for <12 months per RCRA. All new MW is permanently disposed Off Site. Legacy Mixed Waste is buried in the MWMF and was closed in 1990 under RCRA.	All non-legacy MW will be permanently disposed Off site via commercial vendors.
Waste- Non-Radiological		
Hazardous	New HW is interim stored on site for <12 months per RCRA. All new HW is permanently disposed Off Site.	All Hazardous waste will be permanently disposed Off Site via commercial vendors.
Sanitary	Sanitary Waste is permanently disposed on and off site.	Sanitary Waste is permanently disposed on and off site.
Inactive Waste Units		
Soil	There are 497 Surface Units. 296 are remediation complete, 173 are in assessment and 28 are in remediation. A portion of the surface units also have a groundwater component.	Cleaned up (remediated) to $10E^{-4}$ to $10E^{-6}$ residual risk per Industrial or Maintenance exposure scenario consistent with Future Land use. All waste units will be deleted from the National Priorities List (NPL) either individually or by area with Institutional Controls in place as needed.
Groundwater	There are 18 Groundwater units. 5 are remediation complete, 6 are in assessment and 7 are in remediation.	Groundwater cleanup to EPA Maximum Contaminant Levels (MCLs) will be achieved through treatment, Monitored Natural Attenuation, long term monitoring or combination thereof as needed. All waste units will be deleted from the National Priorities List (NPL) with Institutional Controls in place as needed.
EM Facilities		
HLW Tanks	There are 51 HLW Tanks at SRS. Two of the 51 HLW Tanks have been operationally closed under SC Industrial Wastewater Closure Plan.	All 51 HLW Tanks will be operationally closed and grouted in place as the final in situ decommissioning
Nuclear, Radiological and Industrial Facilities	There are 1013 EM Facilities (including the 49 “to go” HLW Tanks) totaling 11.4 million SQ FT. Most are still in use supporting the EM Cleanup Project. Through FY03, 24 facilities had completed decommissioning.	All EM Facilities will be permanently decommissioned unless identified for reuse by another federal program. 858 facilities are planned to be demolished and 156 are planned for in situ disposal. The EM Deactivation and Decommissioning (D&D) cleanup goal and strategy are to D&D in a manner that will not create a new waste unit.

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Table 1.2 Gold Metrics

Performance Measure	Unit	Prior to FY04 Actuals	"To Go"	Life-Cycle Scope
Nuclear Materials				
Plutonium packaged for long-term disposition	containers	353	397	750
Enriched Uranium packaged for disposition	containers	146	2,663	2,809
Plutonium/Uranium residues packaged for disposition	Kg bulk	321.323	93	414
Depleted Uranium & Uranium packaged for disposition	Mt	4551	18,631	23,182
Spent Nuclear Fuel packaged for disposition	MTHM	1.972	34	36
Radioactive Waste				
Liquid Waste eliminated	K-gallons	0	33,100	33,100
Liquid Waste tanks closed	tanks	2	49	51
High Level Waste packaged for disposition	containers	1452	3,608	5,060
Transuranic disposed	cubic meters	1459	13,867	15,326
Low Level Waste/Low Level Mixed Waste disposed	cubic meters	61,998	157,528	219,526
Safeguards and Security Areas				
Material Access Areas eliminated	areas	0	4	4
Environmental Management Facilities			0	
Nuclear facility completions	facilities	4	196	200
Radioactive Facility completions	facilities	0	45	45
Industrial facility completions	facilities	23	569	592
Inactive Waste Units				
Remediation complete*	inactive waste sites	304	211	515

*Four of the 304 Release Site Completions were reopened for additional characterization during FY03, per regulatory agency request.

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1.4 End State Vision Summary

The SRS Cleanup Reform Vision is to complete the EM Closure Project by 2025.

SRS encompasses over 300 square miles with over 1,000 facilities concentrated within only 10 percent of the total land area. As facilities are deactivated and decommissioned, operations will be further concentrated to a central core area. The land surrounding the central core area provides a protective buffer. All facilities and inactive waste units from the Cold War era (1952-1989) are being deactivated, decommissioned, and remediated. Many will require post-closure monitoring and maintenance.

The EM Closure Project is scheduled for completion by 2025, at which time EM will have completed its mission at SRS and will not require the use of any facilities. SRS will continue under Federal control with restricted recreational and industrial/maintenance worker use, with no residential use. Production areas with no reuse plans will be cleaned to an industrial maintenance criterion. All nuclear materials and spent nuclear fuel will be dispositioned by reuse or disposal. The end state for the five SRS production reactors and three chemical separations plants, which includes the high-level waste (HLW) vitrification facility, is in-situ decommissioning. Other industrial facilities will be demolished. HLW will be vitrified as a prelude to geologic disposal and the 51 storage tanks will be emptied and filled with grout. Remediation of the 515 inactive waste sites that comprise the Environmental Restoration Program and contaminated groundwater will be finished but require monitoring in perpetuity to verify that cleanup has been achieved.

Chapter 4 addresses current and 2025 end state hazards in more detail in an integrated manner with mission, facility and land use planning.

Chapter 4 describes the 2025 end state for all SRS EM facilities. For simplicity, this section focuses on major facilities. Much of the information used to articulate the SRS Cleanup Reform Vision is contained in the *Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan* (WSRC-RP-2003-00233), and a draft *Comprehensive Cleanup Plan*. These plans define two end states for facilities and waste tanks and two end states for waste sites.

EM Facility and Waste Tank End States

EM Facility End State

Demolition. Demolition includes demolishing and removing the entire facility to grade, and decommissioning as necessary to meet established release criteria. The end state must be compliant with applicable regulations and with the goal of no new waste sites created at SRS.

In-Situ Disposal (ISD). ISD is the planned end state for some structurally robust facilities for which demolition would be very expensive and unnecessary. In this case, radiological and other hazardous material is removed and the facility or waste tank is decontaminated to a level that meets established criteria, and additional barriers are emplaced as necessary. Some period of post-decommissioning monitoring may be required. The end state must be compliant with applicable regulations and with the goal of no new waste sites created at SRS.

Waste Site End States

No further Action (NFA) NFA is the end state when, upon completion of the characterization or remediation process, sites are determined as needing no further remedial action and are available for unrestricted use.

Long Term Stewardship (LTS). LTS provides safe and effective protection from residual hazards while optimizing future land and resource use. LTS may be achieved through the use of active or passive controls.

Soil and Groundwater Project End States

The SRS Soils and Groundwater Project consists of 515 separate projects arising from the Cold War era (1950-1989). Surface units vary in size from a few square feet to tens of acres and involve contamination from basins, pits, piles, burial grounds, landfills, and storage tanks, while contaminated groundwater plumes are substantially larger and range up to 1,600 acres.

By 2025, all inactive waste sites that pose a risk to surface water or groundwater will be remediated and controlled and any contaminated groundwater supplies will be remediated or closely monitored. Units that leave waste in place, yet pose no risk to

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local groundwater or the Savannah River, will be placed under institutional controls that feature an inspection, surveillance, maintenance, and monitoring program with access restrictions.

1.5 Cleanup Goals and Strategy

1.5.1 PMP Vision and Goal

The SRS EM PMP is a vision and a plan with the stated goal to complete the EM cleanup project by 2025 within prescribed funding targets totaling approximately $17 billion.

The initial EM PMP was developed and issued August 7, 2002. The SRS Cleanup Reform Vision was to accelerate completion of the site's EM missions and transform SRS fully to a site focused on national Security. The PMP outlines specific actions that DOE is taking to accelerate the SRS cleanup program to as early as 2025. The goal was to reduce the cost of SRS cleanup by $8 to $12 billion and shorten the cleanup schedule by 15 years or more.

Since 2002, many initiatives have been put into place and many more are required to enable the accomplishment of the PMP vision and goal.

1.5.2 PMP Status

The SRS EM PMP has been endorsed by SRS's regulators as evidenced by the May 22, 2003, Letter of Support for Accelerating Cleanup at SRS and the July 2003 Memorandum Of Agreement for Achieving an Accelerated Cleanup Vision. See Appendix H Regulatory Support and Agreements.

The SRS EM PMP is currently being revised to reflect significant changes since issuance of the first PMP in August 2002. Significant changes include Contract Modification # M100, issuance of the *Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, renegotiation of the Federal Facility Agreement Appendix E, and preparation of this draft SRS *Risk-Based End State Vision*.

1.5.3 Site cleanup Strategy

Integrated Regulatory Strategy and Area Closure Concept

The integrated regulatory strategy and area closure concept is described in the *SRS Comprehensive Cleanup Plan* (CCP), Revision 1, March 2004. The CCP is a product of the May 2003 Memorandum of Agreement for Achieving an Accelerated Cleanup Vision for SRS between the DOE-SR, SCDHEC, EPA Region 4. The CCP describes how environmental remediation and EM facility decommissioning activities will be executed to accelerate, complete and delete areas of SRS from the NPL. Deleting an area from the NPL demonstrates to SRS stakeholders that EPA, SCDHEC and DOE-SR have determined that cleanup of the area is complete, and no additional cleanup is planned. Groundwater cleanup activities will often continue although waste units cleanups have been completed.

1.6 Cleanup Status

1.6.1 Risk Balancing Success at SRS

CERCLA/RCRA Waste Unit Graded Approach

SRS has utilized and benefited from the graded approach as evidenced by the CERCLA and RCRA/CERCLA waste units that have either Interim or Final Record of Decisions with a component of the remedy that is defined as a Mixing Zone, Monitored Natural Attenuation, and/or passive remediation. These include:

- passive soil vapor extraction with monitoring at Miscellaneous Chemical Basin/Metals Burning Pit and A-Area Burning/Rubble Pits;
- mixing zones at D-Area Oil Seepage Basin, Old F-Area seepage Basin, and L-Area Burning/Rubble Pit/Rubble Pile/Gas Cylinder Disposal Facility;
- monitoring at D-Area Burning Rubble Pits, and C, F, K, P-Area Coal Pile Runoff Basins;
- monitored natural attenuation at K-Area Burning/Rubble Pit;
- passive remediation with natural biodegradation at P-Area Burning/Rubble Pit.

SRS has made gross estimates of the volume of groundwater addressed by these low energy/passive approaches and compared this volume to a hypothetical active remedy (i.e., pump and treat) applied to the same volume. Applying broad assumptions in support of the comparison, SRS has avoided actively remediating more than 3 billion gallons of groundwater with no measurable risk increase.

Additionally, the SRS RCRA program has virtually institutionalized the graded approach for all of the groundwater remediation being conducted under RCRA. These include:

- phytoremediation for the Mixed Waste Management Facility Groundwater,
- bioremediation with Mixing Zone for the Sanitary Landfill Groundwater,
- barrier walls with base injection for the F&H Seepage Basin Groundwater,
- passive soil vapor extraction for the A/M Area Groundwater.

The referenced remedial efforts will result in billions of gallons of groundwater being passively remediated or allowing natural processes address the contamination and avoiding aggressive, active remediation with no measurable risk increase.

Old Radioactive Waste Burial Ground (ORWBG) Closure

An example of some of the advantages that are realized by an area approach is the Old Radioactive Waste Burial Ground (ORWBG) and the General Separations Area Consolidation Unit (GSACU). For these units, SCDHEC, EPA, and DOE have agreed to forego extensive subsurface characterization and perform a consolidated remedial effort for multiple waste units, respectively. The ORWBG characterization effort was deemed unnecessary due to the known inventory, process history, and corresponding principle threat source material and risk levels. The consolidated remedial effort entails the combining of four significantly contaminated Soils and Groundwater Project (SGP) waste units into one, under a single remedial action, due to their proximity to each other and their similar health and environmental threats.

The General Separations Area Consolidation Unit (GSACU) consolidates five waste sites into one and is the largest and highest environmental risk project in the Soil and Groundwater Projects Program. DOE, EPA, and SCDHEC approved the GSACU Record of Decision (ROD) in September 2002. Through the use of project teaming with the core team members from the DOE, EPA, and SCDHEC the ROD was approved three months earlier than the scheduled milestone.

As a result of the teaming process employed to achieve approval of this ROD the core team was recognized by the EPA's Office of Solid Waste and Emergency Response (OSWER) with the Bronze Metal Award for cost savings. The effort accelerated the schedule of the regulatory process by two years and saved an estimated $5 million through the streamlining of regulatory documentation and minimizing repetitive reviews.

The resultant remedy in the GSACU ROD achieves over 99% risk reduction from the waste site cleanups for the future industrial worker to the 10^{-6} risk at the unit surface. Capping the final waste site, the Old Radioactive Waste Burial Ground (ORWBG), over buried waste and the contaminated materials from the other sites is much more protective to the workers and the public as opposed to excavating the waste material. The approved alternative will enable the ORWBG be closed for approximately $150 million less than a remedy that would have required excavation, packaging, transporting and disposing of this material at WIPP or other suitable repository.

EM Facilities D&D Risk Balancing Successes:

Several examples of balancing risk in the D&D Program are shown below.

- Evaporating water and grouting the 105-R Disassembly Basin. Alternative studies were prepared using multi-attribute decision making tools. An Engineering Evaluation/Cost Analysis (EE/CA) was prepared which met CERCLA criteria.
- The "SuperModel" that was developed formed the basis for decision making in the *EM Integrated D&D Plan*.
- The cleanup of the 105-R basin water utilizing innovative technology resulting in huge cost savings both operating and in waste disposal. Published papers are available that describe the process, savings and successes.
- Deactivating buildings across the site to remove risk and reduce costs. Many examples of these including Heavy Water Component Test Reactor (HWCTR), Ford Building, 321-M, 330-M and 331-M.
- The site-wide Risk Mitigation Program which systematically evaluated the higher risk facilities and removed the hazards, lowering the risks, in many facilities across the site.
- Decommissioning of the 412-D Heavy Water Towers not only removed the risk but returned approximately $600,000 to the government over-and-beyond the cost to decommission the facility due to the sale of the scrap metal.

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- Decision to use commercial standards and a fixed price contractor to decommission the aging 232-F Tritium Facility saving millions of dollars.

EM Facilities D&D Future Risk Balancing Opportunities

Opportunities for future risk balancing for EM facilities D&D include the following:

- The "SuperModel" developed for the D&D Plan should be used to sequence and prioritize future facility D&D.
- In-situ Disposal in lieu of demolition for the final end state of many robust facilities across the site.
- Evaporation and grouting of the remaining reactor disassembly basins.
- Integration of facilities and soils & groundwater to close entire areas at once.

1.6.2 Cleanup Accomplished

The SRS cleanup program has been actively reducing risk across all components of the Environmental Management Program. Protecting human health and the environment is a fundamental priority of the cleanup program and SRS efforts to reduce risk in order to maintain this protection have resulted in noteworthy accomplishments. In the mid-1990s, the site began to emphasize cleanup completion, which resulted in the realization of significant cleanup results. This shift enabled SRS to achieve increased risk reduction. Today, risk reduction is achieved through a variety of techniques, including waste and materials stabilization and processing; waste removal and/or disposal; source term remediation or immobilization; mitigation of contamination transport and, minimizing waste generation.

For example, early in the High Level Waste (HLW) program it was recognized that some HLW sludge, a very high source-term material, was contained in single-walled underground storage tanks. Because these type of tanks lack sufficient containment that exists in double-walled tanks, there was a real threat that the sludge could leak from the tanks into the surrounding soil, which would contaminate that soil and potentially the groundwater under the tanks. For that reason, in the late 1980s, sludge that was contained in four single shell tanks (Tanks 17, 18, 21 and 22) was moved into double-walled tanks. This waste was then prepared for vitrification through the Defense Waste Processing Facility (DWPF). HLW canister production began in DWPF in 1996 and through March 2004, 1,575 canisters, or 30 percent of the total projected canisters, have been produced. Another HLW risk reduction effort involved closing Tanks 17 and 20 in 1997. These tanks were filled with grout, thereby removing any threat these tanks posed to workers and the surrounding environment.

Considerable progress has been made toward aggressively "working off" the inventory of the various solid wastes (SW) that have been generated through years of SRS operations. Since 1998, 2,940 cubic meters of hazardous waste, 1,156 cubic meters of mixed waste and 64,952 cubic meters of low-level waste has been disposed. Dispositioning these wastes effectively reduces the risk of release that could occur with their continued storage. Transuranic (TRU) waste resulting from nuclear material stabilization activities has been stored at SRS for years. The TRU waste poses a significant risk due to waste characterization uncertainties and the potential for the build-up of hazardous gases that could lead to an environmental release of contamination. SRS has been characterizing and processing TRU waste in order to ship this waste to the Waste Isolation Pilot Plant (WIPP). Shipments of TRU waste drums began in FY01. Through FY03, SRS had completed shipments of 6,790 drums of TRU waste to WIPP, with 5,824 drums shipped in FY03 alone.

In the 1990s, the Solid Waste (SW) program's focus broadened to include not only managing and dispositioning the inventory of legacy wastes and newly generated waste discussed above, but to actually reduce the amount of waste that was being generated. For instance, reduction efforts in FY02 and FY03 resulted in SRS reducing the generation of more than 6,000 cubic meters of waste, significantly exceeding its goal of 2,597 cubic meters.

Accelerated cleanup and risk reduction are being achieved in the Nuclear Materials Management (NMM) program through the stabilization and processing of nuclear materials, many of which were designated as at-risk materials in recommendations developed by the Defense Nuclear Facilities Safety Board (DNFSB). Milestones established in the SRS Implementation Plan responding to recommendations from the DNFSB have, in most cases, been achieved or accelerated. Through FY03, NMM has completed stabilization of 123,679 units of the total 143,264 units of nuclear materials (86 per cent complete). These stabilized nuclear materials include the following:

- 96,400 gallons of plutonium solutions (100 per cent complete)
- 18,470 of 19,555 reactor targets/assemblies
- 2,664 of 2,813 SRS plutonium residues
- 548 containers of other offsite residues (100 per cent complete)
- 863 cans of plutonium for interim repackaging (100 per cent complete)
- 3,800 of 5,400 gallons of Special isotope solution (Am/Cm, Np)

Since 1995, the NMM program accomplishments have been notable. Some of these accomplishments include

- processed more than 335,000 liters of plutonium 239 (Pu-239) solutions in F & H Areas
- processed 2,579 items of Pu residues, 266 containers of Pu metals and 599 containers of Pu oxide through FB-Line and 235-F
- completed processing of 13,300 liters of Pu-242 solutions in H Area
- processed 8,629 kilograms of uranium in highly enriched uranium through H Area
- completed processing of 15,884 Mk-31 targets
- processed 1,657 Mk-16/22 assemblies (88% complete)

Specific accomplishments during FY03 include:

- Accelerated Receiving Basin for Offsite Fuel (RBOF) deinventory
- Continued consolidating Rocky Flats Plutonium (Pu) material at SRS
- Began repackaging Rocky Flats classified Pu Metal
- Completed K-Basin Deactivation
- Disposition 728-F and 730-F depleted uranium trioxide powder (DUO)
- Transferred Americium/Curium (Am/Cm) to HLW
- Initiated F Canyon deactivation and reduction of surveillance and maintenance (S&M)
- Continues dissolving Mark (Mk)-16/22 SNF in H Canyon
- •Completed Sterling Forest Oxide Material Campaign
- Began blending of highly-enriched uranium (HEU) solutions and transferred to Tennessee Valley Authority
- Began packaging Pu metal into 3013 containers
- Completed the development of non-Moxable Pu disposition path
- Continued dissolution of Pu Residues and converting appropriate material to oxide

SRS continues to receive spent nuclear fuel (SNF) from foreign and domestic research reactors in support of non-proliferation objectives to keep SNF secure, safely stored and protected. SNF will be consolidated to a central storage location in L Area. To date, K Area Disassembly Basin has been de-inventoried of its SNF and is deactivated. Likewise, de-inventory efforts at the Receiving Basin for Off-Site Fuel (RBOF) are underway, with approximately 99 per cent of the RBOF fuel already moved to L Area Disassembly Basin. The RBOF facility will undergo a deactivation program, for risk and mortgage reduction, following de-inventory completion. By the end of FY2005; RBOF will be in a deactivated state awaiting a final disposition decision. Currently, the Department of Energy is finalizing their selection of the disposition technology to be used for SNF inventories across the DOE complex. All SNF stored at SRS is projected to be treated, packaged and shipped to the repository by the end of FY2020.

Soils and Groundwater Project (SGP) focuses on cleaning up contamination that exists in the environment to protect the public, the SRS workers and the environment. The cleanup methods focus on treating or immobilizing the source of the contamination to mitigate contamination transport through soil and groundwater, both on SRS and off-site, and cleaning up or slowing the movement of contamination that has already migrated to the environment. Since the beginning of the SGP program in 1992, 300 of the 515 contaminated waste sites have been completed.

Throughout the SGP there has been continuous improvement in technologies, regulatory processes and project management. In recent years, remediation methods have been evolved to more efficient and cost-effective approaches, such as bioremediation, monitored natural attenuation, barometric pumping, solar-powered microblowers, and dynamic underground steam stripping. In addition, immobilizing source term material with impermeable clay caps or/and grouting waste in place are a cost-effective way to fix contamination in place while minimizing the potential to affect worker health and safety.

In the D&D program, the site completed the decommissioning of 24 facilities in FY03. The “Assets-for-Services” concept was used successfully to reduce the footprint of facilities by approximately 71,000 cubic feet. This was accomplished for less

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than $1.1 million, a cost saving of approximately $10 million, when compared to the estimated cost of $11.1 million to perform the work using traditional D&D methods. Facility D&D is underway in M-Area and for other identified facilities in the DOE-WSRC Contract Modification 100.

The site has developed and used the following tools to assist in the Deactivation and Decommissioning project planning and execution process:

- Comprehensive Facility List (CFL) of 1,013 identified facilities.
- End State Determination Model to assist in the determination of end states for each facility.
- Facility Ranking and Sequencing Model was developed and used to optimize the sequence of facility D&D from FY03 – FY25.
- Deactivation Candidates' Model
- D&D ROM Estimating Model used to estimate D&D costs of all facilities on the CFL.
- Graded Approach to Decommissioning
- Integrated Mapping

Obviously, over the last few years, SRS has emphasized completing its cleanup program and thus, reducing the risk associated with years of operations. The results described above are some of the benefits realized from the SRS shift from risk management and risk containment to accelerated risk reduction. Looking forward, with a continued emphasis on cleanup completion, SRS will be able to accelerate projects that result in greater risk reduction while continuing to protect human health and the environment.

1.7 Site Missions - Past, Current & Future

This section describes the site's Strategic Mission Areas in alignment with three of the DOE HQ Strategic Plan goals for Environment and Defense.

- Environmental Management
- Nuclear Weapons Stewardship
- Nuclear Nonproliferation

This section addresses Corporate Management, which provides the over arching priorities for *how* business will be conducted in all SRS mission areas. Programs for Environmental Management (EM) and the National Nuclear Security Administration (NNSA) are addressed including the associated Nuclear Material Disposition Maps. It also includes Site Long Range Planning and EM Life Cycle Planning Assumptions and addresses planned and potential future SRS missions.

Corporate Management

Corporate Management guides *how* business will be conducted in the mission-related areas, forming the underlying basis of what is important across the site and cross-cutting all mission areas. This area addresses the fundamental principles, values, and systems critical to the SRS. The goals of Corporate Management are to excel in environmental, safety, and health performance; to demonstrate excellence in customer satisfaction and stakeholder/regulator involvement; to maintain a skilled workforce; and to manage efficiently and effectively. Priorities of Corporate Management are described in the five management focus areas, as discussed below.

- **Safety and Security.** To protect workers, the public, and the environment and to protect national security interests.
- **Technical Capability and Performance.** To achieve a diverse workforce that is highly trained, qualified, and motivated and to ensure that SRS facilities and infrastructure are available to support assigned missions.
- **Community, State, and Regulator Relationships.** To demonstrate to the community, state, and regulatory agencies that SRS meets its obligations and communicates openly and honestly.
- **Cost Effectiveness.** To ensure that products and services are delivered through the efficient operation of facilities, cost-effective contracting, and effective project management.
- **Corporate Perspective.** To integrate activities across the site, throughout the DOE complex, and with other governmental agencies.

1.7.1 Environmental Management

Nuclear Materials Management (NMM)

NMM Program Description

The Nuclear Materials Management Program is responsible for the management of excess nuclear materials, including transportation, stabilization, storage and disposition of these materials. The primary nuclear materials in this program include components from dismantled weapons, including plutonium from SRS and from other DOE sites, residues from weapons processing activities and other legacy materials, such as irradiated spent nuclear fuel (SNF) received from previous SRS reactor operations and domestic and foreign research reactors, unirradiated fuel materials, and legacy residues. The stabilization activities occurred in the chemical separations facilities in the center of the site. The program mission includes:

- Safe management of SRS and certain Rocky Flats nuclear materials and conversion of "at-risk" nuclear materials into stable forms suitable for interim to long-term storage;
- Processing nuclear materials for the DOE/Tennessee Valley Authority (TVA) interagency agreement for transfer of uranium to TVA for use in its power reactors;
- Establishment of plutonium stabilization and packaging capability to meet the DOE Standard for Stabilization, Packaging, and Storage of Plutonium-Bearing Materials;
- Safe interim storage of special nuclear materials from other DOE sites, heavy water, and other nuclear materials awaiting disposition; and
- Receipt, storage and consolidation of spent nuclear fuel, along with spent fuel management and disposition, including processing, as required.

Nuclear Materials Disposition Maps

Figures 1.1 through 1.3 describe the planned processes and ultimate disposition for plutonium and other special nuclear materials at the Savannah River Site. In many cases, portions of the materials shown in the Sources/Materials Columns are still undergoing characterization to determine if the material is, in fact, suitable for the disposition path shown. In addition, many of the end state dispositions shown in the figures are currently a best projected pathway and will require preparation of, or modifications to existing, National Environmental Policy Act (NEPA) documentation, facility operating licenses, facility authorization bases, etc., in order for the pathways to be realized. For these reasons, figures are subject to change as analyses are performed, options are further evaluated, legal documentation is modified, stakeholder input is obtained, and DOE programs are authorized and funded.

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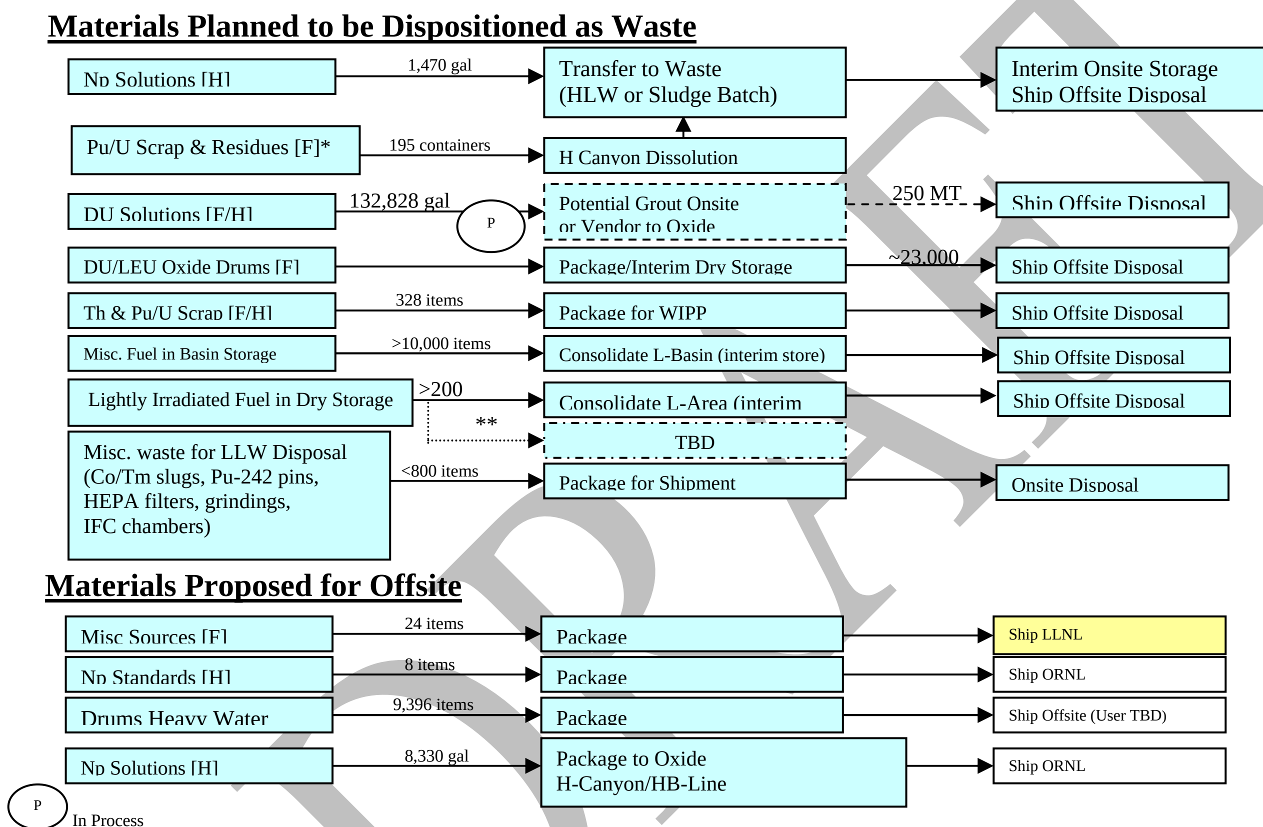
EM Owned Nuclear Materials at SRS



* Materials currently in 235-F and FBL vaults

** TBD per Contract Modification M100, option open for processing in H-Canyon and blend down to LEU for TVA use.

Figure 1.1 EM Owned Nuclear Materials at SRS

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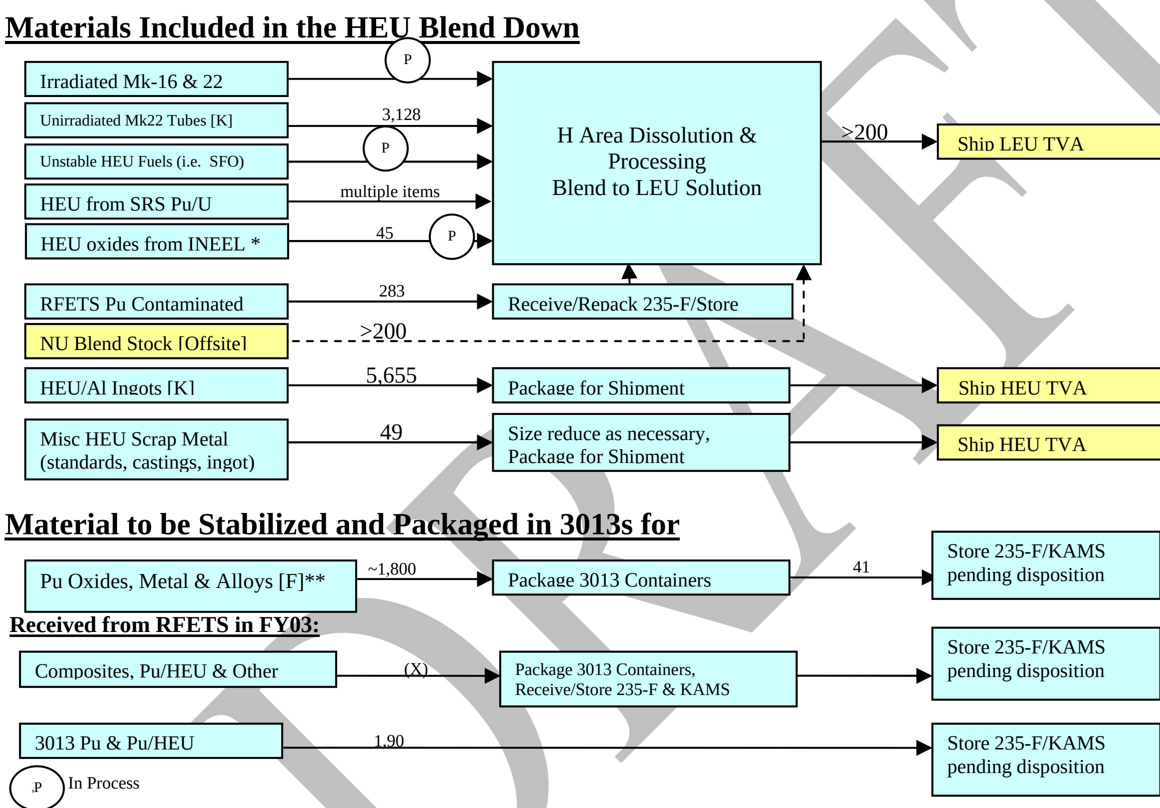
EM Owned Nuclear Materials at SRS (Continued)



* - INEEL HEU Oxides - oxides originally from RFETS already shipped and dissolved in FY03. Samples of Group C oxides shipped in FY03.

** Materials currently in 235-F and FBL

Figure 1.2 EM Owned Nuclear Materials (continued)

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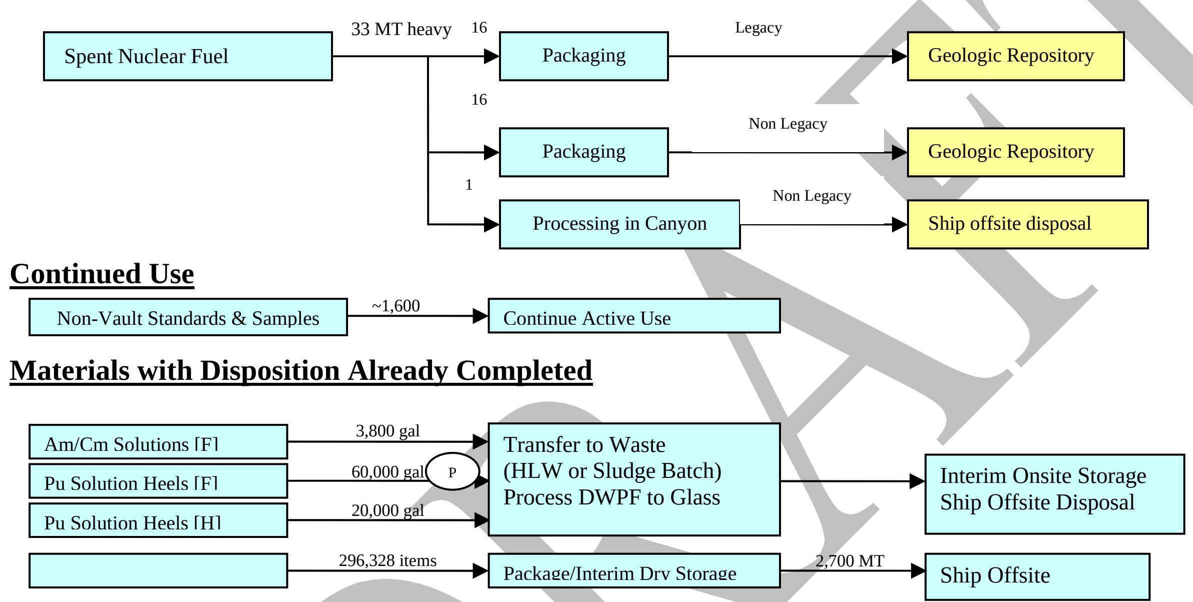
EM Owned Nuclear Materials at SRS (Continued)



* - INEEL HEU Oxides - remainder of Group C oxides will be shipped after FY03.

P In Process

Figure 1.3 EM Owned Nuclear Materials at SRS (continued)

NMM Background:

The focus of U.S. nonproliferation efforts is to ensure the safe, secure, long-term storage and disposition of surplus, weapons-usable plutonium and highly enriched uranium (HEU). In July 1998, the United States and Russia signed an agreement to provide for the removal of approximately 50 metric tons of plutonium from each country's stockpile. DOE has implemented a program to provide for safe and secure storage of surplus weapons-usable fissile material (plutonium and highly enriched uranium) and a strategy for the disposition of surplus weapons-usable plutonium through mixed oxide (MOX) fuel approaches.

NMM Stabilization and Storage of Legacy Materials

On May 26, 1994, the Defense Nuclear Facilities Safety Board (DNFSB) issued *DNFSB Recommendation 1994-1 to the Secretary of Energy, May 26, 1994.* This document notes the DNFSB's concern that the halt of the production of nuclear materials left some nuclear materials in the nuclear processing stream in a state that, for safety reasons, needed immediate stabilization. The DOE has given high priority to accelerated cleanup and closure of sites and the disposition of nuclear materials and waste. The DOE's vision is to complete cleanup at most of its 113 sites by 2006.

DOE has developed critical closure paths and timetables for closure activities, and progress has been made in identifying waste and nuclear materials inventories, determining final disposition paths, and evaluating opportunities for program improvements and cost avoidance. Several major NEPA analyses and associated Records of Decision (RODs) have been completed that determine the disposition paths for surplus plutonium and highly enriched uranium. Other decisions have been made under NEPA regarding stabilization efforts for materials such as at-risk spent nuclear fuel and target materials to resolve near-term storage vulnerabilities and prepare the materials for disposition.

SRS has made progress in stabilizing nuclear materials for long-term storage in anticipation of final disposition. All imminent hazards have been mitigated, and SRS has released a plan to stabilize the remainder of the legacy nuclear materials identified by the DNFSB. The site's chemical separations facilities support DOE's commitment to complete this stabilization work. SRS is mid-way through an 11-year program to stabilize its legacy materials. SRS personnel are working with DOE-HQ and other sites to develop cost-effective solutions for the technical challenges presented by the legacy materials around the DOE Complex currently awaiting stabilization. At the conclusion of the stabilization mission, the processing facilities will transition to minimum surveillance and maintenance necessary to maintain the optimum safety envelope, pending decontamination and decommissioning.

DNFSB Recommendation 2000-1 to the Secretary of Energy, January 14, 2000 identified numerous problems that still were unresolved in 2000 and recommended a prioritized list of technical actions that need to be resolved to mitigate the hazard of these materials. DOE has prepared a schedule for completing the material stabilization. The strategy for addressing these DNFSB recommendations is resulting in expeditious stabilization of SRS materials and early stabilization of certain limited quantities of plutonium from the Rocky Flats Environmental Technology Site. This strategy will also help maintain the process capability for converting plutonium and highly enriched uranium received from off site locations.

Additional details on the management of nuclear materials can be found in *Implementation Plan for the Remediation of Nuclear Materials in the Defense Nuclear Facilities Complex, Revision 3, May 31, 2000* and *A Strategic Approach to Integrating the Long-Term Management of Nuclear Materials: The Department of Energy's Integrated Nuclear Materials Management Plan* (Report to Congress, June 2000).

The K-Area Material Storage Facility Project (KAMS) is modifying K-Area facilities to provide cost-effective, interim storage of non-pit, legacy plutonium metals and oxides in the years before the new plutonium disposition facilities are available. The Rocky Flats Environmental Technology Site is accelerating its site closure to 2006, from 2010, in order to realize a significant reduction in life-cycle costs. KAMS is an important part of new plutonium disposition missions announced in the ROD for the *Surplus Plutonium Disposition Final EIS* (FR Vol. 65, No. 7, January 11, 2000), designating SRS as the site for new plutonium disposition facilities.

Spent Fuel Management

The site's Spent Fuel Management Program receives and safely stores non-commercial spent nuclear fuel (SNF), unirradiated material, and legacy residues, as well as maintains the facilities in which these materials are stored while awaiting ultimate disposition.

This program is an integral part of DOE's initiative to provide safe and secure storage and disposition of excess weapons-usable materials. SRS safely stores and manages aluminum-clad SNF from foreign and domestic research reactors and is working toward packaging this fuel to a form suitable for a permanent repository.

A Treatment and Storage Facility (TSF) will be located in and adjacent to the existing 105-L Building and will be used to prepare the SNF inventories not scheduled for stabilization processing in canyon facilities. The mission of the TSF will be to prepare the SNF in a "road ready" form for shipping and ultimate disposal in a Nuclear Regulatory Commission (NRC)-licensed geologic repository. The TSF is anticipated to be on-line by fiscal year 2011.

Using the direct disposal technology, SNF will be packaged in standard canisters with neutron poisons. These canisters will be co-disposed with the site's HLW canisters in a geologic repository for ultimate disposal.

DOE has also decided to continue to store small quantities of higher actinide materials until determination of a final disposition.

Currently, SNF fuel assemblies, which were stored in the Receiving Basin for Offsite Fuel (RBOF), were transferred to the L-Area fuel storage basin. RBOF is located in H Area near the center of the site and had operated to receive and store offsite fuels since 1964. SRS plans to use L Basin, for all future SNF receipts, as the sole SRS receipt and storage facility. RBOF is undergoing a facility deactivation process following completion of the SNF deinventory program. More casks are expected over the project lifetime, of which some casks will be from foreign sources. Foreign fuel receipts are anticipated to extend through 2014, while domestic fuel receipts will continue through 2019. Deinventory of L Basin through the Treatment and Storage Facility is expected to begin in 2011 and to complete by 2020.

Heavy Water

Current inventories of heavy water will remain in a safe storage configuration pending the identification of a buyer and sold as excess inventory. C, K and L Areas will be used to store heavy water in drums and tanks as consolidation programs continue. SRS currently has approximately 1,600 metric tons of heavy water stored in these areas. Several alternate dispositions have been proposed in the event that a buyer or buyers can not be located and qualified.

High Level Waste

Program Description

The mission of the High Level Waste (HLW) Program at SRS is to provide safe and efficient receipt, storage, and processing of highly radioactive liquid waste to support both site operations and DOE plans for permanent disposal of radioactive waste. In total the current HLW liquid waste inventory at SRS is approximately 37 million gallons (420 million curies), stored in 49 underground waste storage tanks in F and H Areas.

HLW System

The HLW Program is a highly integrated system of facilities to manage this highly radioactive liquid waste. The system involves the following: interim waste storage, liquid waste evaporation, removal of waste from tanks, tank isolation and closure, waste pre-treatment, vitrification of the high-level waste component at the Defense Waste Processing Facility (DWPF), disposal of the low-level waste component at the Saltstone Facility, and interim storage of vitrified high-level waste canisters onsite pending transfer to a federal repository. The HLW facilities are all located near the center of the site for protection of the public and are in close proximity to each other. All of the facilities and infrastructure necessary to store, transfer, pre-treat and vitrify the high-level waste are operating, except those required to process the radioactive salt component.

The waste stored in SRS tanks can be broadly characterized as being either "sludge" or "salt." Sludge waste, which is insoluble and settles to the bottom of the waste tank, generally contains strontium, plutonium, and uranium in the form of metal hydroxides. Sludge waste, which is insoluble and settles to the bottom of the waste tank, mostly contains insoluble salt compounds with small amounts of strontium, plutonium, and uranium in the form of metal hydroxides. In total, there are approximately 37 million gallons of liquid waste at SRS: 3 million gallons of sludge waste and 34 million gallons of salt waste. For disposal, the high-level components of both the sludge and salt waste will be vitrified at the DWPF and sent to a federal repository for permanent disposal. The decontaminated low-level components of salt waste will be sent to the Saltstone Facility for onsite disposal.

The 37 million gallons of liquid, high-level radioactive waste in inventory at SRS are stored in 49 underground waste storage and processing tanks. In addition, two waste storage tanks have been emptied and closed, for a total of 51 original tanks. The waste storage tanks are located in two separate "tank farms," one in H Area and the other in F Area. These two tank farms receive liquid waste as it is generated from the Separations Canyons and waste processing activities, particularly recycle water from DWPF and wastewater from waste pretreatment. These waste tanks are continuously monitored to ensure safety and protection of the environment.

Evaporation

To more efficiently utilize tank available storage space, the liquid waste is volume-reduced by evaporation, leaving less volume to be stored. Three evaporator systems are currently used at SRS, the 2H, 3H and 2F evaporator systems. Since available tank storage space is very limited, evaporator operations are critical to assure the tank farms maintain adequate storage and receipt capacity. Overall, the available tank storage space in the tank farms will continue to decrease until salt processing becomes operational. (Salt waste is the largest waste component by volume.)

Waste Removal

Removing the stored waste from tanks can be an involved process. During bulk waste removal, water is added to waste tanks and agitated by slurry pumps. This suspends the solid sludge waste or re-dissolves the soluble salt waste. The resulting liquid slurry can then pumped out of the tanks and transferred to waste pre-treatment tanks. Bulk waste removal is a multi-year process. First, each waste tank must be retrofitted with slurry and transfer pumps and various support systems for the removal process. These retrofits can take between two and four years to complete. During waste removal, the pumps initially are operated near the top of the liquid and then are lowered to proper depths as waste is slurried and transferred out of the tanks. Bulk waste removal normally takes between six to twelve months, with the pumps being left in place for removal of the last few inches of waste. There are several initiatives underway to streamline the waste removal process using new and innovative pump technology.

Tank Cleaning and Closure

After the bulk waste has been removed from a tank, the tank is ready for heel removal and water washing, isolation, and filling with grout. Heel removal and water washing are used to remove the last several inches of residual waste "heel" in the bottom of the tank. Spray nozzles wash down the tank sides and bottom and specialized equipment removes this residual waste. Next, the tank is isolated by cutting and capping power, steam, water, and air service lines and sealing all tank risers and openings. Finally, the tank is filled with layers of grout, which chemically and physically bind any remaining waste, leaving the tank safe for long-term surveillance and maintenance.

The schedule for waste removal and tank closure is part of the Federal Facility Agreement (FFA) between DOE, the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC).

Two of the 51 HLW tanks have been closed (tanks 17F and 20F), which are the first tanks to be closed in the DOE Complex. Of the remaining 49 tanks, 22 are old-style tanks that do not meet current requirements for secondary containment and leak detection. These old-style tanks must be removed from service and closed by 2022 to meet FFA regulatory commitments.

DOE has prepared an environmental impact statement on the current method of tank closure, called the *Savannah River Site High-Level Waste Tank Closure EIS* (DOE/0303), ROD issued 67 Fed. Reg. 53784 (08/19/2002). DOE has selected the preferred alternative identified in the Final EIS, Stabilize Tanks – Fill with Grout, to guide development and implementation of closure of the high-level waste tanks and associated equipment at the SRS. Following bulk waste removal, DOE will clean the tanks if necessary to meet the performance objectives contained in the General Closure Plan and

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the tank-specific Closure Module, and then fill the tanks with grout.

Waste Pre-Treatment and Processing

Once waste has been removed from tanks, it undergoes pre-treatment and processing. Sludge waste must first be “washed” to reduce the amount of non-radioactive aluminum and soluble salts, thereby ensuring that the waste meets DWPF Waste Acceptance Criteria and federal repository requirements as well as reducing the overall volume of high-level waste to be vitrified. During sludge processing, large volumes of wash water are generated and are returned to the tank farms where it is volume-reduced by evaporation. Over the life of the waste removal program, the sludge waste will be blended into a total of ten separate sludge “batches” to be processed and fed to DWPF for vitrification. Currently, the HLW System is actively removing and vitrifying sludge waste.

For salt waste, the salt solution that has been removed from waste storage tanks is processed to separate radioactive cesium and trace amounts of strontium and plutonium. This separated waste is highly radioactive. It contains most of the radioactivity of the original salt waste but only a small fraction of the original volume. This high-level waste is vitrified at DWPF. The remaining waste, which has had its highly radioactive components separated out, is low-level, decontaminated salt solution can be safely disposed onsite at the Saltstone Facility. It contains the bulk of the original volume of salt waste. Separating salt waste into its high-level and low-level components greatly reduces the amount of waste that must be vitrified into glass canisters and, therefore, greatly reducing the capacity and costs of the federal repository being built to dispose of the HLW glass canisters. Until a salt processing capability can be developed at SRS, the High Level Waste System is removing and vitrifying only sludge waste.

The current plans for salt processing include three distinct processing methods: Low Curie Salt Processing; Actinide Salt Processing; and the Salt Waste Processing facility. Low Curie Salt processing removes the interstitial liquid from the salt, thereby removing the majority of the cesium and leaving a low curie decontaminated salt solution. Actinide Salt Processing adds an actinide removal step to Low Curie Salt Processing in order to remove excess actinides from the decontaminated Salt Solution. The Salt Waste Processing facility, once constructed, will process the concentrated cesium salt solutions to remove both cesium and actinides. Once the cesium and actinides are removed, the decontaminated salt solutions will be processed into a grout form at Saltstone. In July 2003, salt processing at SRS was potentially impacted by a court ruling on the Waste Incidental to Reprocessing (WIR) process. This legal issue is currently being resolved and could result in future changes to the SRS salt program.

Vitrification at DWPF

The washed sludge waste and the concentrated cesium and actinides from salt waste will be vitrified into DWPF glass canisters. Vitrification consists of a complex sequence of carefully controlled chemical reactions in which waste is blended with glass frit and melted at 2100 degrees Fahrenheit to vitrify it into a borosilicate glass form. The resulting molten glass is poured into 10-foot-tall, 2-foot-diameter, stainless steel canisters. As the molten glass cools and solidifies, it immobilizes the radioactive waste within the glass structure. Once the canisters are permanently sealed and the external surfaces are decontaminated to meet US Department of Transportation requirements, they are stored on an interim basis onsite in the Glass Waste Storage Building (GWSB). The GWSB is a standard, steel-frame building with a below-ground, seismically qualified concrete vault with vertical storage positions for 2,159 canisters. A five-foot thick concrete floor separates the storage vault from the operating area above ground. When the first GWSB is filled to capacity, a building will be required and is currently in design. For final disposal the canisters will be shipped to a federal repository where the waste will remain radioactive for thousands of years. The federal repository is currently scheduled to be ready to receive canisters in FY2010. SRS has requested that the repository receive all SRS canisters by 2020.

Since the beginning of it operation in FY1996 through FY2003, DWPF has filled 1475 canisters. Based on current HLW inventory and projections for existing missions, a total of approximately 5,000 canisters are estimated to be produced to complete waste removal. SRS is expected to complete vitrifying waste by FY2019.

Saltstone Facility

After salt processing, the low-level decontaminated salt solution is sent to the Saltstone Facility for final processing and disposal. At Saltstone the low-level waste is mixed with cement, fly ash, and slag to form a solidified mixture or grout, known as “saltstone” that can be safely and permanently disposed in onsite vaults. Currently the Saltstone Facility is being prepared for Low Curie and Actinide Salt Processing. The Saltstone Facility will process waste through fiscal year 2019 and then will be readied for deactivation and closure.

Solid Waste Program

Program Description

The mission of the Solid Waste (SW) program is to provide cost-effective solid waste management services to support DOE missions at SRS and across the DOE-Complex. The program provides treatment, storage and disposal capabilities required for SRS to safely store, treat and ultimately dispose of both legacy wastes and newly-generated wastes which arise from operations at SRS. The program is responsible for reducing the legacy waste inventory of all the waste types to zero and therefore obtaining a steady-state condition with ongoing waste being treated and disposed as it is generated. The five types of waste managed by this program include sanitary waste; low-level radioactive waste; hazardous waste; mixed waste (both hazardous and radioactive); and transuranic (TRU) waste (solid waste contaminated with alpha-emitting TRU radionuclides that result primarily from the canyon and analytical laboratory facilities at SRS).

Sanitary waste is a solid waste that is neither radioactive nor hazardous. Sanitary waste typically consists of materials that would be received by a municipal sanitary landfill and contains salvageable or recyclable materials such as scrap metal.

Low-level waste is radioactive waste that is not classified as high level waste, TRU waste, spent fuel or byproduct material and does not contain any hazardous waste. Typically, low-level waste at SRS is radioactively contaminated materials such as job-control waste, small and large equipment, plastic sheeting, gloves, soil and suspect contaminated materials used in radiological areas.

Hazardous waste is identified by the EPA and requires management in accordance with specific regulatory mandates. The SW program receives, stores and arranges off-site treatment or disposal for SRS-generated hazardous wastes. Examples of hazardous waste include materials such as lead, solvents, paints and pesticides.

Mixed waste is both hazardous and radioactive waste, includes solvent-contaminated wipes, debris from operations, cleanup, construction, etc. from radiological areas. The SW program is responsible for receipt, interim storage, treatment and disposal of mixed waste. Treatment and/or disposal is performed at SRS facilities, at other DOE sites or commercial vendors.

TRU waste is contaminated with alpha-emitting TRU radionuclides that meet very specific criteria. Some TRU waste at SRS contains hazardous waste and must be managed in accordance with regulatory requirements. These wastes are and have been generated primarily by plutonium separations facilities and analytical laboratories. Additionally, some of the TRU waste at SRS is from offsite generators from the late 1970s.

The treatment, storage and disposal of sanitary, hazardous, mixed and mixed-TRU wastes are subject to regulation by EPA and SCDHEC in accordance with the Resource Conservation and Recovery Act (RCRA). The site has regulatory commitments concerning treatment of legacy wastes for these waste streams. These commitments are contained in the site Treatment Plan, which was developed in response to a consent order. In addition, current RCRA regulations provide specific timescales for treating newly-generated wastes.

The treatment, storage and disposal of low-level waste are subject to the provisions of DOE Order 435.1, which establishes specific timescales for the disposal of newly-generated wastes.

Figure 1.4 shows the movement (treatment and disposal) of the various types of wastes at SRS.

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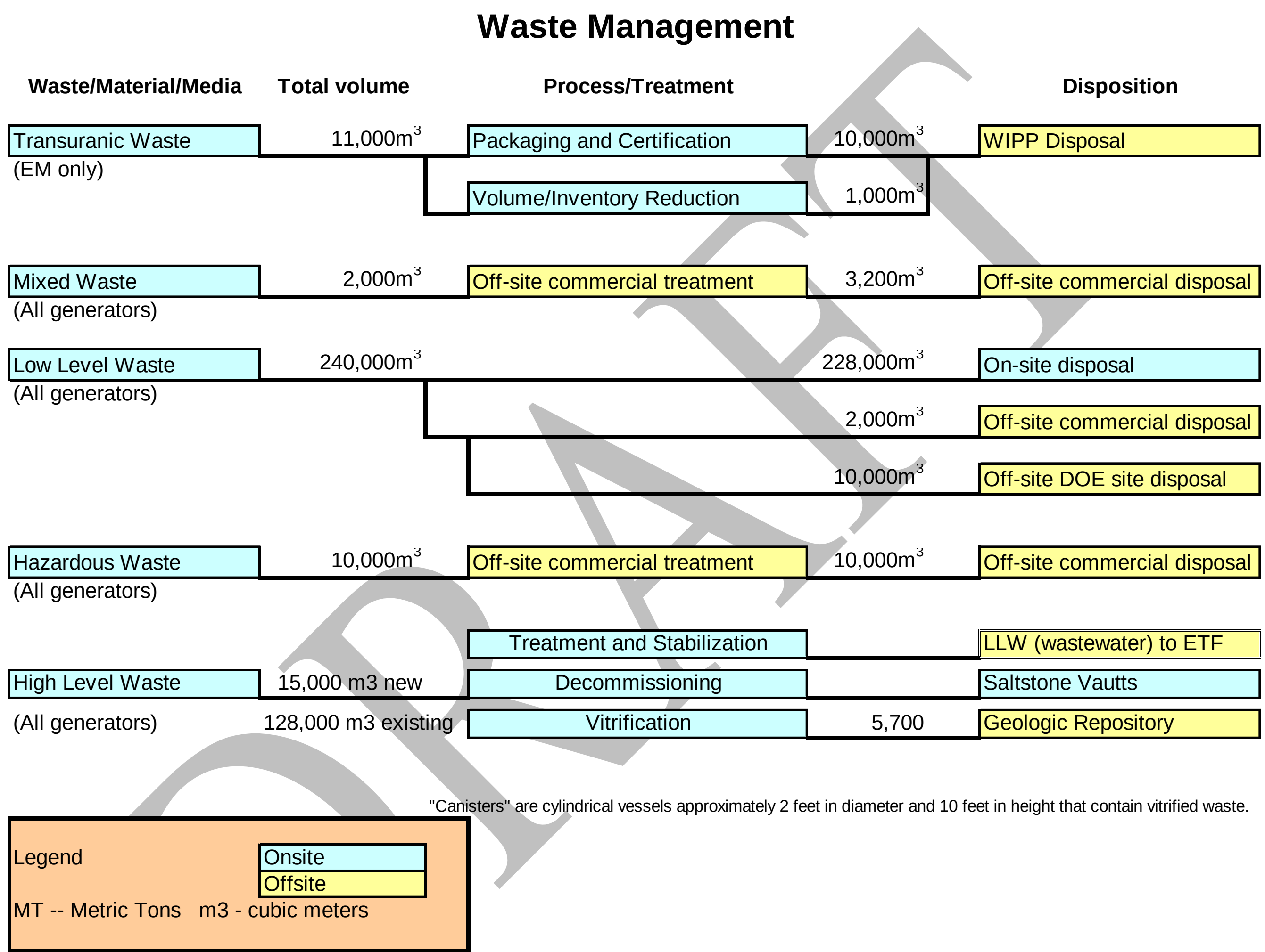

Figure 1.4 Material movements currently in the Waste Management Program

Soils and Groundwater Project

Program Description

The Soil and Groundwater Closure Projects program mission is to investigate inactive waste sites and groundwater units and, if needed, remediate releases of hazardous substances to minimize or eliminate potential risks to human health or the environment. Remediation of waste sites is regulated by RCRA and CERCLA. In 1993, SRS entered into a legally binding cleanup agreement, the Federal Facility Agreement (FFA), with the SCDHEC and the EPA, which lays out the schedule for remediating the inactive waste and groundwater units.

There are currently 515 inactive waste and groundwater units in the SRS ER program. The waste units vary in size from a few square feet to tens of acres and include basins, pits, piles, burial grounds, landfills, and tanks. The contaminated groundwater plumes are substantially larger and range up to as much as 1,600 acres. Although soils, groundwater and surface water have been impacted by radionuclides and hazardous chemicals as a result of over 50 years of operations, mitigating actions have helped to limit the contamination to local areas and to reduce any significant offsite risk. An assessment of the human health and environmental risks associated with each waste site is conducted to determine the cleanup priority, where focus is placed on the highest risk first. Additionally, as facility dispositioning is performed, the impact to waste sites and the surrounding environmental medial will be assessed for appropriate actions.

If preliminary evaluations show that a waste unit may be a candidate for cleanup, an investigation and site characterization are conducted. If the investigation determines that there is a risk to human health or the environment, cleanup alternatives are evaluated, selected and implemented. Currently, of the 515 identified SRS units that require evaluation, 306 have been closed or are in remediation. In addition, there are 11 groundwater contamination areas with treatment systems actively remediating the groundwater contamination.

With support from the regulatory agencies, SRS deploys state-of-the-art technology to increase remediation effectiveness and efficiency. By using remediation techniques such as vacuum extraction, a process that removes solvents from the soils above the groundwater, SRS has been able to reduce the potential for more groundwater contamination, as well as reduce cleanup cost and expedite cleanup, while protecting human health and the environment. Another technology SRS has successfully deployed involves using nature in remediation. For instance, phytoremediation, the technique of using natural processes occurring in vegetation, is being used to mitigate contamination in groundwater.

Deactivation and Decommissioning Project

Program Description

The site Deactivation and Decommissioning (D&D) program's goal is to deactivate inactive and/or excess facilities and maintain these deactivated facilities in safe condition to minimize risk to workers, the public and the environment; and to decommission facilities.

The program is responsible for dispositioning the 1,013 SRS structures that have been identified as excess on the Comprehensive Facility List (CFL). Included are industrial, radiological, and nuclear facilities.

Dispositioning is the process that begins once a decision is made that a facility is no longer needed to support SRS missions and the facility is declared excess. The facility disposition process is divided into four activities:

1) Safe Shutdown/Transition is the process of terminating operations in a controlled manner, placing the facility in stable and known conditions, identifying hazards, eliminating or mitigating hazards, and transferring programmatic and financial responsibilities to the site D&D Program.
2) Deactivation places a facility in a stable and known configuration by removing the chemical and radioactive materials, shutting down or mothballing the facility equipment and mitigating the hazards.
3) Safe Storage is the dormant period when Post-Closure Care and Maintenance activities occur to ensure the protection of human health and safety and the environment.
4) Decommissioning places a facility in its final end state and can include dismantlement, decontamination, or some other activity that makes the land available for either unrestricted use or for limited applications.

In addition to dispositioning those structures which have already been identified as excess, the program will disposition facilities as they are determined to be no longer necessary to support SRS missions. For instance, F Canyon, the RBOF and the Consolidated Incineration Facility (CIF) will be shutdown/ transitioned into the disposition program. The SRS *EM Integrated D&D Plan*, originally conceived as the EM End State Plan, defines the end state for each facility on the CFL.

Modification 100 to the DOE Contract No. DE-AC09-9SR18500 identifies a Target and Maximum Case of facilities to be decommissioned in the FY03–FY06 timeframe. The Target Case would decommission 112 facilities. The Maximum Case includes 113 facilities and represents the desired end state at the conclusion of the contract performance period (end of FY2006). Achievement of these objectives provides tremendous programmatic and financial benefits to DOE, as well as accelerating closure to meet the sites Risk-Based End State Vision.

Savannah River Technology Center (SRTC)

SRTC - Applied Research and Technology Development

SRTC Vision for the Future

The Savannah River Technology Center has served the Savannah River Site for 50 years. It has played a key role in the development of all of major processes that the site that allowed for the production of plutonium and tritium. Since the end of the cold war, the laboratory has continued it's role in the nuclear arena as well becoming a key player in the development of new technologies to support the environmental cleanup. As the 21st century opens, SRTC is poised to share it's historic knowledge with the other DOE sites around the complex and with other key federal missions like homeland security. SRTC currently has 3 major mission areas: Environmental Management, Nuclear Security, and Energy Security.

Environmental Management Mission

Savannah River Technology Center (SRTC) provides the specific, applied technologies needed for WSRC to accomplish the accelerated cleanup of the site. The center identifies, develops, deploys, and optimizes technologies for the site while reducing risk and cost.

In environmental restoration, there is an increased emphasis on monitored and accelerated, natural attenuation for contaminant cleanup and the development of more cost-effective, reliable technologies for long-term monitoring of waste and waste unit closures. Bioremediation technologies are also being successfully used for chemicals and metals in soils and the groundwater.

Chemical process flow sheet modifications and material characterizations are being developed to allow for the F-Area closure and the completion of H-Area activities. Many residues, legacy wastes, and excess nuclear materials are being addressed.

The cleanup and closure of the high level waste tanks are being accelerated by providing treatment technologies and technical support. Chemical cleaning and lower-cost grout formulations have been developed to assist tank closure. Cesium separation and actinide removal technologies are being deployed to treat the salt waste prior to immobilization in grout. The vitrification of the high level waste sludge is also being accelerated by increasing the waste loading and the melt rate with new formulations and melter improvements.

Nuclear Security Mission

Historically, SRTC has played an important role in supporting the site's Defense Programs mission, and will continue to do so for the foreseeable future, along with other missions now under the purview of the National Nuclear Security Administration (NNSA). The Center will continue to develop new technologies and troubleshoot existing processes in the Tritium Facilities used for extraction, separation, purification, and storage of tritium gas, and loading of the gas into reservoirs destined for the nuclear weapons stockpile. In concert with DP Operations, and under the direction of the Weapons Labs, SRTC will continue to perform surveillance testing of tritium reservoirs to ensure their proper functioning and safety. SRTC will also persist in its support of planning efforts to establish a modern pit manufacturing facility, and investigate new processes for such a facility, as directed by DOE.

Another major responsibility of NNSA is ensuring the nonproliferation of nuclear weapons and disposition of excess nuclear materials so they do not fall into the hands of potential US adversaries. SRTC currently assists in this effort by developing chemical processes for disposal or stabilization of legacy nuclear materials, and will continue to do so for several more years. SRTC also develops instruments for detection of radioactive materials even to very low levels to assist in nonproliferation objectives. In future years, SRTC expects to support NNSA by troubleshooting problems with processes in the Pit Disassembly and Conversion Facility (PDCF), which will dismantle pits retired from the stockpile and create a feed supply to the MOX Fuel Fabrication Facility. SRTC will also play a major role in the Materials Identification & Surveillance Program, which will be under SRS direction in the future. This surveillance program is conducted to ensure plutonium materials in vaults at SRS remain safely stored until final use or disposal in the distant future.

Energy Security Mission

A primary goal of the National Energy Policy is to increase the domestic energy supply from a variety of sources, including nuclear power. The policy also foresees an increasing role for hydrogen as the primary energy carrier in a future U.S. energy system as was outlined in the President's State-of-the Union speech in January. Furthermore, the DOE FreedomCAR initiative seeks to develop a transportation system that uses hydrogen as the primary fuel for automobiles and trucks, thus significantly reducing the nation's dependence on imported petroleum. The DOE Nuclear Hydrogen Initiative seeks to address the key issues necessary to pave the way for a joint DOE-industry nuclear-hydrogen demonstration plant by around 2015.

SRTC is poised to participate in the nuclear renaissance that is expected to develop over the first half of the 21st century as a result of these initiatives. SRTC recently facilitated the formation of the Southeast Universities Research Reactor (SEURR) Consortium to pursue the establishment of a regional university research, training and education reactor user facility at SRS. Current membership consists of 17 colleges and universities from 9 southeastern states, as well as representatives from industry and federal laboratories. If realized, the project would be located in an Energy Park to be established at SRS to facilitate the rejuvenation of nuclear power by the construction of advanced nuclear power reactors (so-called Generation III+ designs) through a Congressional mandated DOE/industry sharing program. In addition, an Energy Park would provide an excellent location for the demonstration of centralized nuclear hydrogen production as is being evaluated in an SRTC NERI led project. The project will provide a design for a gas-cooled reactor (Generation IV) which will provide high-temperature heat to a hydrogen production plant. Hydrogen is proposed to be piped to a local chemical plant which uses large quantities of hydrogen routinely in the production of various chemicals. In addition, other demonstrations of the various distribution systems for widespread hydrogen usage would be supported. This project would be the next step in the Nuclear Hydrogen Initiative to demonstrate the infrastructure necessary to demonstrate the reliable delivery of hydrogen to large-scaled users as well as to distributed locations such as hydrogen filling stations.

SRTC - Basic and Applied Environmental and Ecological Research

The Savannah River Ecology Laboratory (SREL), established at the SRS in 1951, provides an independent evaluation of the ecological effects of SRS operations through a program of ecological research, education, and outreach. SREL scientists currently are organized into four research groups that interact with one another and cooperate with other research and management personnel on the site, at other DOE facilities across the country and at universities around the world.

The **Advanced Analytical Center for Environmental Sciences (AACES)** is a research and development group that employs an integrated, multidisciplinary, multi-scale "atoms to ecosystems" research approach. This group strives to provide a more complete understanding of chemical species distributions and transformations and to define the primary physicochemical, mineralogical, and biogeochemical controls required to predict contaminant migration accurately, to evaluate environmental risk, and to design cost effective yet environmentally sound remediation strategies.

Ecological Stewardship research focuses on ecosystem health and land stewardship. The goal of this group is to improve understanding of the current ecological status of various habitat types on the SRS, assess the ecological risk to organisms from real or potential land use threats, and provide recommendations on land stewardship to promote ecosystem health. Researchers in this group examine the effects of land-use patterns on abiotic and biotic resources, including individual, population, community, ecosystem, and landscape levels of ecological organization. They also document changes in the physical environment, determine the influence of these changes on the physiology and behavior of individual organisms, and conduct population-to-landscape-level research in natural and disturbed, terrestrial, wetland, and aquatic sites of the SRS and surrounding area.

The **Ecotoxicology, Remediation, and Risk Assessment (ETRRA)** research group conducts research on the toxicology of contaminants in ecological settings and the development and use of cost-effective remediation technologies. The data they collect are useful to the process of conducting risk assessments for contaminated areas on the SRS. Application of site- or region-specific data to the risk assessment process can greatly alter the acceptable remediation activities, making them more effective and efficient, likely reducing the costs and increasing the probability of cleanup.

The **Radioecology** research group studies the transport, fate, and effects of radioactive elements in the natural environment. Current research addresses critical gaps remaining in knowledge regarding the transfer of radionuclides through food chains and their effects in natural ecosystems. This research is conducted at SRS, at other DOE facilities in the U.S., and in territories of the former Soviet Union with the goal of determining the fine-scale spatial distribution of radionuclides on SRS, studying DNA damage in irradiated organisms and the population consequences of living in contaminated environments on the SRS and at Chernobyl, and studying the transport of radionuclides in natural environments, especially former SRS cooling ponds.

Other EM Programs

The other components of the SRS EM Program are described below. While these components of the EM Program do not have strategic initiatives that will directly accelerate the completion of the EM program associated with their scope, these components are critical to executing the scope of the EM program.

Safeguards and Security (S&S) Program

Program Description

The Savannah River S&S program serves national security interests through the protection of SRS nuclear weapons materials, production facilities, property and classified matter from theft, sabotage, or unauthorized control. The baseline also supports the *SRS Strategic Plan* elements of national security and nonproliferation as required by the Atomic Energy Act, other federal statues, Executive Orders, and other federal directives.

Physical security components include protective force personnel, equipment and facilities, physical security protection systems, and a comprehensive Personnel Security program. These elements provide for intrusion detection and assessment, entry/access controls, barriers/secure storage, explosive detection and monitoring of tamper-indicating devices and alarms in support of the control and accountability of special nuclear materials (SNM).

Information Security components provide for effective classification, declassification, and unclassified controlled nuclear information (UCNI) programs to ensure information is identified (and protected) at the proper security level. Operations security, classified matter protection and control (CMPC), export control, and security incidents programs ensure consistent guidance and appropriate levels of awareness and controls are established across the site. Cyber Security programs are directed toward the protection of information systems that process classified or unclassified information or are critical to facility operations to avoid the compromise of national security information.

Wackenhut Services, Incorporated – Savannah River Site (WSI-SRS) is contracted by the U. S. Department of Energy's Savannah River Operations Office to provide paramilitary security services for the Savannah River Site. The WSI-SRS mission is to provide security of the nation's nuclear weapons stockpile, nuclear materials and protect people and the environment in a safe and cost-effective manner. WSI-SRS provides protection of DOE S&S critical assets from theft, diversion, sabotage, espionage, unauthorized access, or compromise.

Security services include access control, law enforcement, criminal investigations, traffic control, special nuclear material shipments, canine explosives and drug detection, helicopter operations, river patrol, security alarm system monitoring and special response team operations.

As the SRS continues to accelerate closure, safeguards and security at the site will continue to change. A graded approach will be employed to ensure that the appropriate level of security is afforded to the various assets located at the SRS. The level of security in a given area will be

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commensurate with the value/importance of the remaining asset(s) during the progress of the closure activities.

SRS Infrastructure Program

The SRS Infrastructure Program is responsible for managing and operating all general site infrastructure that supports existing EM missions and ensure that adequate margins of safety and supply are maintained for other DOE missions hosted at the site. This includes planning and managing the capital projects to support the infrastructure systems. General site infrastructure consists of the support facilities, systems and equipment that provide necessary services to the site's missions, both inside and outside the limited area fences. It includes intra-area utilities and common appurtenances such as roofs, administrative housing, laboratories, and emergency systems. It does not include operating facilities that unique or directly related to the mission capabilities required to execute EM and other DOE missions at the site. The systems and facilities that comprise general site infrastructure are:

- Administrative facilities;
- Central Laboratory Facility (CLAB);
- Computing/Telecom;
- Site Dams;
- Electrical transmission system;
- Heating, ventilation and air-condition (HVAC) systems;
- Roofing systems;
- Sanitary sewer system;
- Savannah River Technology Center;
- Security and Fire Alarm System;
- Steam system;
- Transportation (site roads and railroads); and
- Water systems (process and domestic water)

SRS general site infrastructure continues to maintain support to all enduring site missions. Any new missions must plan additional infrastructure requirements into their respective programs.

The Office of Strategic Planning and Analysis is developing out-year infrastructure plans based on current EM planning assumptions.

Essential Site Services and General and Administrative Programs

The Essential Site Services (ESS) and General and Administrative (G&A) programs provide operating support that enables the site to meet its mission requirements. EM and other DOE missions at the site fund these programs as site overhead expense. Types of work categorized as ESS scope includes:

- Environmental Services, such as environmental monitoring and reporting and regulatory compliance support and oversight.
- Safety and Health Protection Services, including dosimetry, respiratory protection, medical services, and the SRS safety program.
- General Site Services, such as engineering services, maintenance programs, non-destructive testing, geotechnical support, criticality and safety analysis programs, emergency services and fire department, fleet management, etc.
- General Site Infrastructure that operates and maintains shared facilities across the site, such as roads, bridges, parking lots, grounds, dams and other facilities outside the general areas.

The G&A work scope includes functions such as the following:

- Procurement services and materials management;
- Information technology;
- Management services including contract administration, document control and records management;
- Human resources;
- Internal and contractual audits;
- Legal Counsel;
- Finance; and
- Public affairs

Natural Resources Management

The site's natural resources mission is to maintain excellence in natural resource stewardship; continue recognition of SRS as a national leader in resource management, research, and science literacy; and provide cost-effective, flexible, and compatible programs to support SRS missions. Most of the site is currently under some form of natural resource management. SREL, SRTC, and the U. S. Forest Service-Savannah River (USFS-SR) bridge the gap between basic and applied science in support of SRS missions and operations. Research into fundamental aspects of ecological and environmental sciences, fate and effects of contaminants in the environment, and the basic biology of native species provides the foundation necessary to improve both remediation and restoration activities and to enhance management of natural resources.

The site is capitalizing on its National Environmental Research Park (NERP) status to enhance international and domestic research partnerships. Capabilities are available to conduct large-scale landscape manipulations that both enhance natural resource management and provide unique field site opportunities that attract university and industrial partners. In addition to research, SRS science and technology organizations have a strong education mission, striving to improve science education and literacy and educational opportunities for diverse groups.

The USFS-SR conducts research in direct support of endangered species and ecological restoration programs to provide the scientific basis for managing natural resources and other land uses in a mission-compatible manner. The University of South Carolina Savannah River Archaeological Research Program studies the archaeological history of SRS and ensures compliance with federal regulations governing cultural resources and antiquities.

The site is currently restoring native vegetative communities and species, including red-cockaded woodpecker habitat, hardwood habitat, pine-savannahs, and wetlands. In addition, this restoration will protect water quality by stabilizing soil and minimizing industrial area runoff through engineering and vegetative management techniques. Wetland restoration at Pen Branch has recently been completed; Carolina bays are being restored; and restoration of the site's dominant natural vegetation, longleaf pine savannahs, is proceeding where compatible with ambient soil conditions. Prescribed burning operations continue to enhance wildlife habitat, facilitate after-timber-harvest regeneration, and reduce forest fuels. Soil and watershed maintenance and stabilization provide infrastructure support to the SRS industrial areas. Natural resource research projects cover a wide range of topical areas, including short rotation woody crops; biodiversity; prescribed fire and smoke management; wetland, pine savannah, and hardwood restoration; and endangered species recovery. Currently, timber sales average 25 million board feet per year, and in fiscal year 2000, timber receipts returned to the U.S. Treasury totaled almost $4.7 million; in fiscal year 2001, $5 million; in fiscal year 2002, $3.1 million; and in fiscal year 2003, $8.3 million.

In June 1999, DOE designated 10,470 acres of the Savannah River Site as a biological and wildlife refuge, creating the Crackerneck Wildlife Management Area and Ecological Preserve. The South Carolina Department of Natural Resources is responsible for natural resources management of this preserve including a program of limited public access for hunting, fishing, and non-consumptive uses.

Cultural Resource Management

The beginning of construction of the Savannah River Site over 50 years ago rewrote history of the Central Savannah River Area. Communities such as Dunbarton and Ellenton vanished, as did rural areas that surrounded them. SRS brought an immigration of scientists and engineers, the likes of which few regions in the nation would ever experience, changing the housing and appearance of the towns these atomic immigrants would move to, changed the make-up of their schools, political parties, and other social organizations, and rewrote local history.

Recognizing the importance of the site's Cold War historic properties under the National Register of Historic Places (NRHP) criteria, DOE commissioned an inventory of the site's Cold War era buildings and structures between 1998 and 1999. This document, *Savannah River Site: Cold War Context and Resource Study*, recommended 220 buildings and structures and the site's layout comprised a National Register-eligible cold War Historic District that possesses national, state, and local significance.

However, with the proposed accelerated cleanup in 2002, a reduction of the site's footprint would involve the demolition, alteration, and decommissioning of some of the site's historic properties. As a result, DOE recognized the need for a management plan to preserve, protect, and mitigate adverse effects to these properties. In October 2003, the *Savannah River Site's Cold War Built Cultural Resources Management Plan* (CRMP) was published. This document is a management tool for DOE managers because it contains guidance on compliance with the nation's preservation laws and describes the way stewardship of historic properties should be integrated with ongoing site missions. The CRMP provides the basis for future work and identifies the effort, its principals, and their roles in implementing the CRMP for Cold War historic properties. Prior to 2003, compliance with federal preservation laws for threatened historic Cold War properties was completed on a case-by-case basis by DOE and aided by the Savannah River Archaeological Research Program (SRARP).

1.7.2 Nuclear Weapons Stewardship:

National Nuclear Security Administration – Defense Programs (NNSA-DP) Missions

The site's Nuclear Weapons Stewardship mission includes maintaining technical expertise in tritium operations, production, and engineering to support the nation's weapons stockpile. This also includes the planning and support of the long-range plutonium pit fabrication contingency.

Tritium Supply

The mission of the Tritium Program is to provide tritium to meet the ongoing requirements of the Nuclear Weapons Stockpile Memorandum, to conduct equipment surveillance operations, and to manage existing tritium inventories and facilities.

Tritium, a radioactive isotope of hydrogen, decays at a relatively rapid rate to a form of helium and must be replenished periodically to maintain weapon viability. At the present time, tritium is available only from recycling tritium from dismantled nuclear weapons and from routine tritium reservoir exchanges from the existing nuclear stockpile. SRS is the only facility in the DOE Complex capable of meeting production requirements of the weapons stockpile and has also become the single storage location for of tritium. Related activities include recovering, purifying, and storing tritium from dismantled weapons and recycling and loading weapon components for the stockpile.

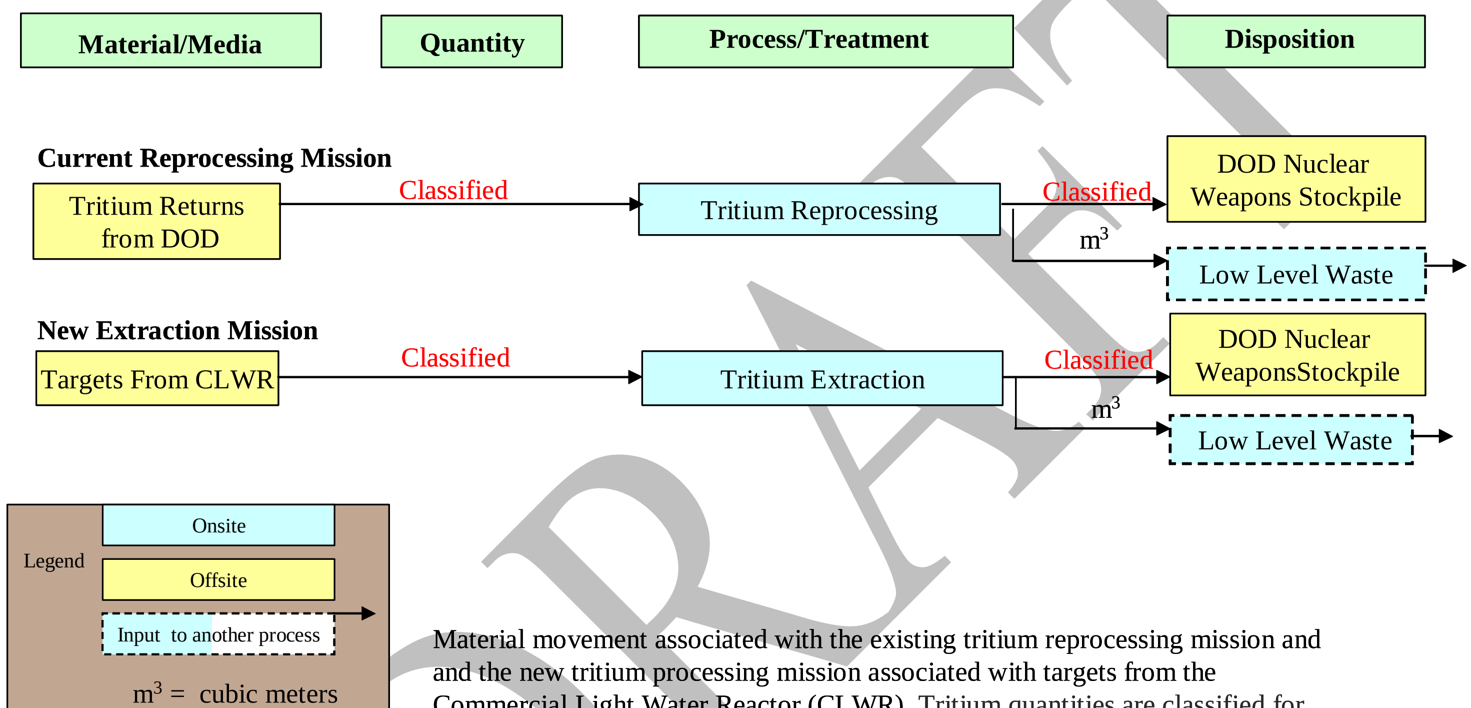
The tritium mission is carried out in a 25-acre compound within the H-Area chemical processing facilities. To continue the site's tritium mission, significant emphasis has been placed on the upgrade and maintenance of the site's tritium facilities to ensure reservoir quality and schedule reliability. A new loading facility was commissioned in 1994, and additional loading capabilities for advance reservoir designs were added in 1998. Under the Tritium Facility Modernization and Consolidation Project, several existing process systems, equipment, and process functions have been relocated to existing buildings to reduce the size of the tritium facilities' "footprint" and reduce operating costs. This modernization project will provide the capability to process tritium from the Tritium Extraction Facility (TEF).

To determine the best source for new tritium production, DOE prepared and issued several Environmental Impact Statements (EISs). The *Consolidated Record of Decision* (ROD) *for Tritium Supply and Recycling* (FR Vol. 64, No. 93, May 14, 1999) determined that the use of commercial light water reactors would be the chosen technology for tritium production. The ROD announcement named the Tennessee Valley Authority's Watts Bar Unit 1 and Sequoyah Units 1 and 2 reactors as the specific commercial nuclear reactors that will provide the irradiation services for the tritium supply.

The ROD also announced that the H Area would be the location for the TEF. This facility will safely and efficiently extract tritium-containing gases from tritium producing burnable absorber rods that have been irradiated in one of the commercial reactors mentioned above. Construction began in August 2000, with operation of the facility projected to begin in 2006. The facility will require industrial development of about four acres adjacent to the existing tritium facilities in H Area. Three major structures are planned: a remote handling area, a tritium processing area, and an administrative support building. Associated with this industrial facility will be a modest expansion of utilities and transportation, mostly within the existing industrial area.

The origin of tritium entering the site for recycling or processing; the process or treatment that will be used to prepare it for use or disposition; and its ultimate use or disposition are shown in Figure 1.5, Tritium Reprocessing and New Processing Material Disposition Map. Because quantities of tritium are classified information, they are not shown on this diagram.

Tritium Reprocessing/Processing



Material movement associated with the existing tritium reprocessing mission and and the new tritium processing mission associated with targets from the Commercial Light Water Reactor (CLWR). Tritium quantities are classified for security reasons. Low level waste is transferred to onsite low level waste treatment processes shown on another diagram.

Figure 1.5 Tritium Reprocessing and New Processing Material Disposition Map

1.7.3 Nuclear Nonproliferation Program (NNSA-NN)

Plutonium Disposition

The Secretary of Energy selected SRS as the location for the construction and operation of facilities to dispose of approximately 33 metric tons of surplus weapons-usable plutonium in a manner that meets the "Spent Fuel Standard." The Spent Fuel Standard is achieved when weapons-usable plutonium is made as inaccessible and unattractive for weapons use as is the plutonium that exists in spent nuclear fuel from commercial reactors. This strategy is acceptable for disposal in a geologic repository per the *Record of Decision for the Surplus Plutonium Disposition Final EIS* (FR Vol. 65, No. 7, January 11, 2000.) The nation's nuclear weapons are disassembled at the Pantex Plant in Texas. Plutonium pits from inside the nuclear weapons that are no longer needed for defense will be sent to the SRS Pit Disassembly and Conversion Facility.

Three new facilities will be required to accomplish the plutonium disposition mission. One facility is the Pit Disassembly and Conversion Facility, which will disassemble the plutonium component of a nuclear weapon, called the pit, and convert the resulting plutonium metal to a declassified oxide form suitable for the MOX Fuel Fabrication Facility. The MOX Fuel Fabrication Facility will blend uranium dioxide and plutonium dioxide, form the mixture into pellets, and load the pellets into fuel rods for use in commercial nuclear power plants. Approximately 33 metric tons of surplus plutonium will be used to fabricate this MOX fuel. The MOX Fuel Fabrication Facility will be owned and financed by DOE but designed, built, licensed, and operated by a private consortium. The facility will operate solely for the disposition of surplus U.S. weapons' plutonium. The facility will be licensed by the Nuclear Regulatory Commission and operated so that the facility will be available for inspection by the International Atomic Energy Agency. The ultimate disposition for the MOX fuel, after its use in power plants, will be a geologic repository.

The third facility is the Waste Solidification Building that will treat the waste streams from both PDCF and MOX.

This approach sends a strong signal to the world of the U.S. determination to reduce stockpiles of surplus weapons-usable plutonium irreversibly. The construction of new facilities for disposition of surplus U.S. plutonium will not take place unless there is significant progress on plans for plutonium disposition in Russia.

Current plans are to construct the new plutonium disposition facilities near the center of the site in F Area. The program to disposition up to 33 metric tons of surplus plutonium is estimated to require approximately 10 years of operation. Additional materials could be declared surplus if the U.S. and Russia agree on further reductions in their respective nuclear weapons stockpiles, therefore, potentially extending this mission. Figures 1.2 and 1.3 show the movement of plutonium materials into and out of SRS and the processing steps that will take place in the plutonium facilities.

Implementation of the new plutonium missions will result in additional waste generation onsite. Table 1.3 provides a comparison of the additional volumes of various wastes that may be generated relative to the volume of waste currently projected in existing missions. The new plutonium missions constitute a small percentage of increase in waste volumes over the existing waste management obligations.

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Table 1.3 Comparison of Waste Volumes (Current Missions vs. New Missions)			
Waste type/Unit of measure	**Current Mission**	**New Mission (10 year total)**	**Percent Change**
Transuranic waste m^3	18,000	1,810	10%
Mixed low-level waste m^3	5,025	50	1%
Hazardous waste m^3	29,000	940	3%
High-level waste (canisters)	5,700	84	1.5%

Table 1.1. Comparison between current and new missions waste inventories

Enriched Uranium Blend Down

The U.S. has declared a total of 174.3 metric tons of highly enriched uranium (HEU) surplus to future weapons needs. One path for making this material unsuitable for nuclear weapons is through a dilution process called “blend down,” which makes this material suitable for productive use in commercial reactors. Of the 174.3 metric tons of HEU, approximately 85% will be converted to commercial or research reactor fuel. The remaining HEU will be disposed of as waste. Of the HEU to be converted to commercial or research reactor fuel, over 33 metric tons is considered off-specification, meaning the fuel will not meet typical reactor fuel specifications; however, with adjustments in enrichment, it will perform similarly to fuel made from virgin material. The Current Stabilization and Storage Material Disposition Map (Figure 1.11) depicts the origin and quantities of nuclear materials, the process or treatment that will be used on the material to prepare it for disposition, and the ultimate disposition of the material.

Of the more than 33 metric tons of off-specification HEU, approximately 21 metric tons is located at SRS. The Environmental Assessment for the Construction and Operation of the Highly Enriched Uranium Blend-Down Facilities at the Savannah River Site (DOE/EA-1322, April 2000) analyzes the environmental impacts of the construction of a new low-enriched uranium loading facility and modifications to current facilities for blend-down of approximately 16 of the 21 metric tons of HEU. The remaining five metric tons of HEU will be shipped to a Tennessee Valley Authority vendor for blend down at the vendor’s facility. DOE negotiated an agreement with the Tennessee Valley Authority to use this fuel for its reactors. SRS will take the 16 metric tons of highly enriched uranium with an isotope content greater than 20% of uranium-235, purify it, and then blend it down using natural uranium (uranyl nitrate) supplied by the Tennessee Valley Authority. The blend down process will yield low enriched uranium (LEU) with an isotope content of less than 5% of uranium-235, suitable for commercial nuclear reactors. The LEU product will be shipped to Tennessee Valley Authority vendors where it will be solidified and made into reactor fuel. Twelve metric tons of off-specification highly enriched uranium is currently stored at the Y-12 Site in Oak Ridge, Tennessee. The agreement with the Tennessee Valley Authority provides for this HEU material to be shipped to the Tennessee Valley Authority vendor for blend-down at the vendor’s facility.

1.7.4 Potential New Missions

Modern Pit Facility

The DOE has a NEPA process under way to determine the site for a Modern Pit Facility (MPF) to replace the functions shutdown at the Rocky Flats Environmental Technology Site in Colorado. Five sites, including SRS are being considered as host sites for the MPF. Rocky Flats was the source for the plutonium portion of nuclear weapons, called the “pit.” Following the shutdown of the Rocky Flats Site, the Los Alamos National Laboratory in New Mexico was selected to recapture pit manufacturing technology and establish an interim small pit production capability. In 2003, LANL produced its first certifiable pit. The Congressional Panel to Assess the Reliability, Safety, and Security of the U.S. Nuclear Stockpile, chaired by Dr. John Foster, noted in its 2002 report that the MPF is needed to fill the most important gap in our current production infrastructure, and that it is especially critical for the U.S. to accelerate work on a modern modular pit facility. The MPF project currently has a 17 year long schedule, with certified pits being produced in 2020. A national project organization and infrastructure consistent with a major system acquisition activity has been established and is functioning. Conceptual design work is currently being performed at SRS, supported and directed by the NNSA and a multi-site team.

Hydrogen Technologies

SRS is currently participating in hydrogen technology programs with the potential for expansion. The national program calls for the deployment of a nuclear-hydrogen generation demonstration plant with associated storage and distribution facilities.

Nuclear Training Center

SRS is currently working with the Southeast Universities Nuclear Reactor Institute for Science and Engineering Consortium to develop strategies for future nuclear education and university research programs. Such strategies could result in the construction of a new reactor shared and managed by multiple universities and sited at a DOE facility. SRS would be considered a candidate site.

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Other Programs

SRS is supporting a variety of national programs in number of areas, e.g., National Homeland Defense, Nuclear Forensics, Fusion Energy, etc. Many of these programs have potential for growth at SRS with reuse of existing facilities or installation of new facilities.

1.8 Program Planning Assumptions for Vision and Long Range Program Planning

This Risk Based End State Vision is based on the assumptions from the *SRS Long Range Comprehensive Plan*, (December 2000), EM Life Cycle Planning Assumptions missions (Ref. Jeff Allison's EM Life Cycle Baseline - Required Program Guidance Letter, dated 9/16/03 to Bob Pedde), Future Use Planning Assumptions (*SRS Strategic Plan*), Facility Use Assumptions, *Preparation of Environmental Management (EM) Program Performance Management Plan* (ref: Jeff Allison's Preparation of Environmental Management (EM) Program Performance Management Plan Revision Guidance Letter, dated March 5, 2004) and assumptions for end states were taken from ten years of internal and external stakeholder participation and resulting plans. These assumptions include the following:

- Health and safety of the public, the workforce, and the environment will not be compromised.
- Funding requirements will reflect meeting all compliance agreements and other regulatory commitments.
- Local and national stakeholder comments and concerns will be addressed.
- Assume a target completion date of 2025 for all EM work scope.
- Beginning in 2026, all Long Term Stewardship activities shall be funded by either Office of Legacy Management or other Program Secretarial Offices.
- There will be no transfer of operating or shutdown facilities to other program offices.
- After missions are complete, facilities will be deinventoried, deactivated, and maintained in a low-cost surveillance and maintenance state that has a very low safety risk.
- The Department of Energy will have a continuing stewardship role, which will require ongoing monitoring and maintenance.
- SRS will accomplish its Environmental Management objectives while continuing to meet critical national security needs through existing and future national security missions.
- Offsite national repositories will be available for permanent disposal of nuclear waste.
- Other DOE sites will be closed or their missions and/or footprint of the land will be reduced, thus increasing reliance on SRS for consolidation and disposition activities.
- National and international commitments will increase emphasis on disposition of surplus nuclear materials.
- Use of performance and risk-based definitions for high level wastes will be used per DOE Order 435.1, Radioactive Waste Management.
- Designation/treatment of SRS as a National Security Site will drive cleanup end state expectations.
- National Environmental Policy Act (NEPA) RODs will be re-issued to support SRS approaches for Spent Fuel Management, Waste Management, Plutonium Disposition, etc.
- There will be capability to ship to federal repositories on accelerated schedules defined in this Vision.
- There will be effective integration across various DOE programs, such as EM, National Nuclear Security Administration (NNSA), Office of Civilian Radioactive Waste Management (RW), etc.
- Risk-based closure strategy for designated facilities and operations will be implemented.
- Tailored requirements, appropriate to facility status and risks will be used and implemented.
- There will be consolidation of EM cleanup funding into a reduced number of appropriation accounts (preferably one) and relief under the line item construction projects that would increase SRS's flexibility to move funds into and out of such projects.
- Workforce restructuring flexibility will be allowed to enable cost-effective execution of site plans.
- There will be regular communication and collaboration between SRS and DOE-HQ and among SRS and other DOE sites to define and resolve issues and facilitate cleanup progress, benchmarking and lessons-learned.
- The canyons will transition to deactivation upon completion of currently scheduled materials stabilization and deinventory activities. This includes offsite materials for which Records of Decision exist.

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- Utilization of F-Canyon: Complete all planned operations and the de-inventory/deactivation activities in F Canyon/FB Line by November 30, 2006. Deactivation of the F Area processing facilities is to be completed in accordance with F-Canyon Complex Deactivation Project Plan, Building 221-F, F-Canyon/FB-Line Facilities.
- Disposition of H-Canyon: Assume that the H-Canyon mission will continue through the completion of the Highly Enriched Uranium (HEU) Blenddown program, and that the H-Canyon will then be placed in hot standby until a transfer and storage facility is available (estimated to be in the FY 2010-11 timeframe.)
- Disposition of non-moxable plutonium: Assume that the plutonium will be stored at SRS until FY 2020, at which time EM will no longer maintain this liability. SRS will most likely have a role in the disposition of non-moxable plutonium; the plutonium will be stored at SRS until FY 2020.
- High Level Waste (HLW) Salt Processing relative to the Waste Incidental to Reprocessing (WIR) decision: Assume Congress enacts legislation that allows salt processing to proceed.
- HLW Tank Closure relative the WIR decision: Assume operational tank closure proceeds regardless of the WIR decision.
- Waste-on-Wheels (WOW): Assume successful implementation of WOW and factor resulting cost savings into the post-FY2006 HLW Removal baseline.
- Infrastructure: Assume that EM will remain the landlord for the foreseeable future and will continue to provide infrastructure services to tenant organizations. Infrastructure that is exclusive to the EM mission will be downsized appropriate for, and consistent with, the accomplishment of the EM work scope. Infrastructure will be maintained beyond the FY 2006 at a level commensurate with ongoing missions.
- Facility disposition, as currently defined in the Westinghouse Savannah River Company (WSRC) Facility Disposition Manual, will continue indefinitely and will be adequately funded.
- Decontamination and decommissioning involves skills and activities that are different from routine operations, maintenance or construction and will be sustained at some minimum level as long as needed.
- Risk reduction will be a key driver for work prioritization decisions within constrained budgets and staffing.
- SRS will remain under federal ownership and its boundaries will remain unchanged.
- No residential use of SRS will be permitted.
- Reducing risk to human health and the environment is a fundamental consideration in end state planning.
- SRS will have access to onsite and offsite locations and repositories in which nuclear, radioactive, and hazardous wastes can be treated and disposed.
- Commitments made to the SRS regulatory agencies in the FFA and the Defense Nuclear Facilities Safety Board will be met.
- EM-owned plutonium (13 Metric Tons) will be dispositioned through a vitrification process in an existing facility at SRS with startup operations beginning in 2011.
  - Complete plutonium vitrification operations consistent with DWPF schedule.
  - This process would add approximately 100 additional DWPF canisters.
  - The empty DWPF canisters will be loaded with plutonium glass cans at the plutonium disposition facility.
  - Approximately 1000 DWPF canisters will contain the plutonium cans.
- All heavy water will be transferred offsite at no net cost prior to decommissioning.
- Foreign Fuel Research receipts of Spent Nuclear Fuel will continue through 2014.
- Domestic Fuel Research receipts of Spent Nuclear Fuel will continue through 2019.
- A Transfer and Storage Facility (TSF) for packaging fuel into standardized canisters and storage will be operational in 2010.
- The Federal Repository at Yucca Mountain will be available to receive Spent Nuclear Fuel by 2011.
- Deinventory basins and TSF and complete shipping to Federal Repository at Yucca Mountain by 2020.
- EM will only operate solid waste facilities through completion of the EM mission.
- EM will continue to provide solid waste services to non-EM waste generators at SRS until 2025.
- SRS will meet or exceed the EM WIPP Transportation Baseline.
- Defense Waste Processing Facility (DWPF) will continue to produce canisters at an average rate of 230 canisters per year (250 canisters per year

through FY 2008) with increased waste loading (equivalent of 280 canisters).
- The new Canister Shipping Facility will be designed, constructed, and online to support shipments beginning in 2010.
- The Federal Repository at Yucca Mountain will be available to receive DWPF canisters by 2010.
- Final shipment of DWPF canisters will occur by 2020.
- Salt Waste Processing Facility (SWPF) will be online by February 2009. Throughput will be maximized for salt treatment prior to completion of HLW sludge vitrification.
- Modifications for Saltstone processing will be designed in FY2004 and will be online by October 1, 2005.
- Sufficient new Saltstone vault capacity will be designed in FY2004 and will be available to support processing from Saltstone by October 1, 2005.
- Operational tank closure activities will begin in October 2005 upon decision to implement the revised Nuclear Waste Policy Act legislation, with Tanks 18 and 19 operationally closed by October 2006.
- The Glass Waste Storage Building #2 will be available by June 2006 for additional canister storage.
- The site Safeguards and Security footprint will be minimized consistent with nuclear materials storage and disposition schedules.
- New technologies will be used to minimize the reliance on security manpower.
- Site security upgrades ("9/11 projects") will be completed.
- An integrated D&D and Soil and Groundwater cleanup approach with cost-effective holistic remedies will be implemented. The approach will be consistent with the Integrated D&D Plan, the RBESV (currently being prepared), and any EM-1 approved variances.
- An area-by-area remediation strategy to bring closure to whole areas of the site will be implemented. This sequencing of areas will be consistent with the latest approved Federal Facility Agreement Appendix E.
- All principles, concepts, and goals of the Memorandum of Agreement for Achieving an Accelerated Cleanup Vision (July 8, 2003) will be implemented or met.
- Decommissioning will be integrated with soils and groundwater closure activities and contamination in the foundations will be removed to a level that does not create an additional waste unit.

2.0 SRS REGIONAL CONTEXT RBES DESCRIPTION

2.1 Physical and Surface Interface

2.1.1 Key Features

See Appendix A for Figures (Maps) that support this SRS Regional Context RBES Description.

A watershed is an area that drains to a common waterway, such as a stream, lake, estuary, wetland, or the ocean. For the past five years, the EPA has joined others to promote the watershed approach nationally to further restore and maintain the physical, chemical and biological quality of our Nation's waters. In particular, EPA has been working with federal, state, and tribal governments to tailor activities and services to local watersheds and their groups.

The watershed approach is made up of three key components:

1. *Geographic Focus:*
   Watersheds are nature's boundaries. They are areas that drain to surface water bodies. A watershed generally includes lakes, rivers, estuaries, wetlands, streams, and the surrounding landscape. Groundwater recharge areas are also considered.
2. *Continuous Improvement Based on Sound Science:*
   Sound scientific data, tools, and techniques are critical to the process. Actions taken include characterizing priority watershed problems and solutions, developing action plans and evaluating their effectiveness within the watershed.
3. *Partnerships / Stakeholder Involvement:*
   Watersheds transcend political, social, and economic boundaries. Therefore, it is important to involve all the affected interests in designing and implementing goals for the watershed. Watershed teams may include representatives from all levels of government, public interest groups, industry, academic institutions, private landowners, concerned citizens, and others.

The CSRA is comprised of 13 watersheds as listed below:

<u>South Carolina Watersheds in the CSRA</u>
Brier
Broad St. Helene
Edisto
Lower Savannah
Middle Savannah
North Fork Edisto
Salkehatchie
Saluda
South Fork Edisto
Stevens

<u>Georgia Watersheds in the CSRA</u>
Brier
Little
Middle Savannah
Upper Ogeechee
Upper Savannah

Administrative

SRS is located in the Central Savannah River Area (CSRA), which contains nine counties in South Carolina (Aiken, Allendale, Bamberg, Barnwell, and Edgefield) and Georgia (Burke, Columbia, McDuffie, and Richmond). While there is no precise definition of the boundaries of the CSRA, for the purpose of this document, CSRA refers to those counties in which activities, commerce, and population would be seriously affected if a facility of SRS's magnitude did not exist. The site's southwestern boundary is formed by the Savannah River, a historical transportation corridor and the recipient of most of the area's tributaries. The site includes portions of Aiken, Allendale, and Barnwell counties.

The Savannah River Site is owned by the Department of Energy, a federal agency. Adjacent land is owned by private property owners, such as corporate landowners.

Major governmental jurisdictions in the area include: Aiken, Allendale, Bamberg, Barnwell, Bath, Belvedere, Blackville, Denmark, Fairfax, New Ellenton, North Augusta, and Williston in South Carolina; and Appling, Augusta, Evans, Grovetown, Martinez, Thomson, and Waynesboro in Georgia.

Other federal agencies also have an impact on the region such as the U.S. Department of Agriculture. The Agricultural Services Center, the Forest Service (USFS), the Agricultural Stabilization and Conservation Service, the Farmers Home Administration, and the Natural Resources

Conservation Service provide significant support for farmers and farm-related activities. The Departments of Commerce, Defense, Health and Human Services, Interior, Justice, Labor, and Transportation also have offices in the region.

The 50-mile radius, the basis for determining the region, is the geographical area required by the Nuclear Regulatory Commission (NRC) to have a Safety Analysis Report, which must include population information. Only the work force required to accomplish DOE's mission and a limited number of visitors have "limited access" to the SRS.

Transportation and Infrastructure

South Carolina is serviced by five U. S. primary routes: I-20, I-26, I-77, I-85, and I-95. I-20 is closest to SRS and is approximately 30 miles from the center of the site. U. S. Highway 278 crosses the northern section of SRS. In addition, U. S. Highway 1 passes through Aiken and Augusta, and U. S. Highway 301 passes through Allendale. Both highways extend to within 20 miles of the center of the site.

Off-site access to SRS is provided by four South Carolina primary roads: SC 125, the main access route from the Augusta/North Augusta/Allendale region, SC 19, which provides access to SRS from the Aiken/New Ellenton region; SC 39, which provides access from the Williston region; and SC 64, which provides access from the Barnwell region.

CSX Transportation and Norfolk Southern Corporation provide railroad service to the CSRA. Both of these railroads have access throughout the United States, Canada, and Mexico.

Commuter air service and jet service to major U. S. cities is provided by two commercial airports in the vicinity of SRS. Bush Field in Augusta is approximately 21 miles from the site; Columbia Metro Airport in Columbia, South Carolina, is approximately 56 miles away from the site.

There are approximately 120 public water systems in the region. All of the county and municipal water supply systems obtain their water from the Dublin/Midville aquifer system. The region has 15 major public sewage treatment systems.

For regional landfill needs, the Three Rivers Solid Waste Authority (TRA) is the mechanism to meet the requirements of the State Solid Waste Policy and Management Act. TRA provides waste management services to local governments in an area consisting of Aiken, Allendale, Bamberg, Barnwell, Calhoun, Edgefield, McCormick, Orangeburg, and Saluda counties. This regional landfill site assists these counties in the placement of GOFER (Give Oil for Energy Recovery) sites, white goods (metal) cleanup and removal, recycling assistance, and the cleanup of waste tires. The Three Rivers Landfill is located off of Highway 125 on property owned by the Department of Energy at the Savannah River Site and it is leased to the TRA. Administration and management of the TRA is provided by the Lower Savannah Council of Governments. In addition, there are nine local sanitary landfills in the area.

Barnwell County is home to a commercial, low-level radioactive landfill.

Since 1999, 35% of South Carolina's electric power has been generated by nuclear reactors; 33% is by coal; 19% by hydroelectric, with some electricity generated by gas and petroleum power plants. In the South Carolina counties located near the Savannah River Site, the South Carolina Electric and Gas Company (SCE&G) provides power. The nearest power generation facility to SRS is in Beech Island, SC. The Erquhart Station combines cycle combustion and coal-fired steam turbines to produce power for SCE&G.

As of 2002, for Georgia, 39% of the power is generated by coal power plants; 12% by nuclear power plants; 11% by hydroelectric power plants with balance of electricity is generated by gas and petroleum power plants. Plant Vogtle, located across the Savannah River in Georgia, is a nuclear power plant owned by Georgia Power Company.

Below is a list of the interstate natural gas pipelines located in the CSRA:

- Dixie Pipeline
- South Carolina Pipeline Corporation
- Southern Natural Gas Company

Surface Contamination

The Savannah River is used primarily to support industry, recreation, and natural habitat development. This river is fed by numerous streams, including five major SRS streams: Upper Three Runs, Four Mile Creek, Pen Branch, Steel Creek, and Lower Three Runs Creek. SRS is situated in three major resource areas: the Southern Piedmont, the Carolina and

Georgia Sand Hills, and the Atlanta Coastal Plan. These characteristics are typical of land forms that resulted from of historical marine sediment deposits in central and eastern Georgia. There are no mountains in the general area.

Because of the land's characteristics and the site's proximity to the Savannah River, soil conservation, flood plain management, and wetland issues play a large part in local planning. For a long time, area residents have recognized the value of the Savannah River and its environs, and much of their recreational life centers around water activities. Thurmond Lake (1200 miles of shoreline), other lakes and the Savannah River offer swimming, fishing, camping, water skiing, boating and hiking.

To maintain water quality for industrial, recreational, and residential use, development plans and monitoring programs are essential for both the functional integrity of the area and the safety, health, and property of the citizens. The South Carolina Department of Health and Environmental Control is responsible for SRS's monitoring programs. In addition, the State of Georgia has raised concerns that groundwater contaminated with tritium might migrate from SRS through aquifers underlying the Savannah River into Georgia by what is referred to as trans-river flow. However, SRS sampled wells in Burke and Screven counties in 2000, and SRS and the Georgia Department of Natural Resources conducted joint sampling in Burke and Screven counties in 2001 and 2002. The overall trend of the data showed a continual gradual decline in tritium levels.

Both the Savannah River and aquifers in the area provide an abundant supply of water. Groundwater is used throughout the CSRA as a domestic, municipal, industrial, and agricultural water supply. The Savannah River is used as a drinking water supply for some residents downriver of SRS. The City of Savannah Industrial and Domestic Water Supply Plant intake at Port Wentworth is approximately 130 river miles from SRS; the Beaufort-Jasper Water Treatment Plan intake, near Beaufort, is approximately 120 river miles from SRS.

Most of the domestic supply of groundwater within the CSRA is produced from the Floridian aquifer system, while the remaining supplies are produced primarily from the Cretaceous age Dublin/Midville aquifer system. The groundwater production from the prolific Dublin/Midville aquifer system is about 50 million gallons per day and satisfies SRS industrial uses and drinking water consumption for the site work force.

Hazard Areas of Concern

There are four National Priority List (NPL) or Superfund sites in the CSRA as shown below:

Name	Listed	Delisted
Savannah River Site	11/21/89	2025
Helena Chemical Company (Allendale County, SC)	2/21/90	N/A
Shuron Plan (Barnwell County, SC)	12/23/96	N/A
Monsanto Corporation (Richmond County, GA)	9/21/84	3/9/98

Local concerns for hazards mainly consist of pollution from local industries into the air and/or the Savannah River. (See Section 2.2.2, Land Uses for more details.)

2.1.2 Differences Between Current State and 2025 end State

There are no known major differences between the current state and the year 2025 in the areas of Administration, Transportation and Infrastructure, Surface Contamination or Hazard Areas of Concern.

2.2 Human and Ecological Land Use

2.2.1 Key Features

Land Uses

Land within the CSRA centers around residential, industrial, commercial, transportation, recreation, and agricultural categories. Upland pine and wetland forests comprise a large percentage of the area. Nonforested wetlands occur primarily along Thurmond Lake and the Savannah River.

Various industrial, manufacturing, medical, and farming operations are conducted near the site. Major industrial manufacturing facilities in the area include textile mills, polystyrene foam and paper product plants, chemical processing facilities, and a commercial nuclear power plant. A variety of crops is produced on area farms, such as forest products, cotton, soybeans, corn, peaches, grapes, and small grains.

Current major uses for land bordering SRS include:

Agriculture – while some livestock, horse farming, and vegetable farming takes place, most of the land is used to produce forest products (for pulp and paper, telephone poles, pine straw)

Light industry - There is currently one 1,500 acre industrial park adjacent to SRS. Bordering this industrial center is the Duratek Low Level Radioactive Waste Disposal Facility. Also in close proximity is Plant Vogtle, a nuclear power facility, directly across the Savannah River from SRS. To ease the burden of the region, SRS has agreed to permit a solid waste landfill within its borders. This facility, the Three Rivers Landfill, is operating under the authority of a fifty-year lease administered by the Lower Savannah Council of Governments.

Light residential – Most of housing on this land is associated with agriculture, however some houses and manufactured homes border the site (small neighborhoods or individual homes).

Recreation – Wildlife is plentiful since over 90% of SRS is not used for industrial purposes, thus extensive outdoor sports activities occur next to SRS. These activities include hunting, fishing, hiking and bird watching.

The topography and other existing physical features and conditions of the area greatly influence land development decisions and policies. Because of the soil types and lack of steep slopes, the area is well-suited for both agriculture and urban development.

Manufacturing and government account for the largest portion of employment in the region (44.8 percent). Augusta, the Fort Gordon Military Reservation, and SRS comprise a significant amount of total developed area. SRS's significance as an employer is only second in the region to Ft. Gordon, Georgia, twenty-five miles from the Savannah River Site. However, even with fewer employees, SRS' economic impact is greater. Further, SRS is the largest manufacturing employer in South Carolina and second only to Wal-Mart as the largest employer in the state.

Forest lands, which dominant land cover in the CRSA, are divided between bottomland hardwoods/deciduous, cypress/tupelo, and pine, which is the most dominant. Although forest lands occur throughout the area, the greatest concentration of pine is in the northwest portion, with hardwood/deciduous and cypress/tupelo forests primarily in stream valleys.

Human Activities

Below are listed the populations of the CSRA counties:

Populations (as of 2001)

County	Population
South Carolina	4,063,011
Aiken	143,905
Allendale	11,045
Bamberg	16,393
Barnwell	23,525
Edgefield	24,470
Georgia	8,383,915
Burke	22,591
Columbia	92,427
McDuffie	21,286
Richmond	198,366

Unlike many Department of Energy sites, SRS is significantly distant from local populations. The Savannah River Site is approximately 22.5 miles southeast of Augusta and 19.5 miles south of Aiken, the nearest population centers.

2.2.2 Differences Between Current State and 2025 End State

From extensive discussions and review of draft and final growth management, transportation and economic development plans for the region, SRS planners can say with assurance that there are no major changes which would affect site missions in the next 20 years. While normal growth is expected in metropolitan counties in the region or in the populated regions of counties around SRS, the predominant land uses in the areas adjacent to SRS are expected to remain the same.

Land uses adjacent to SRS are not expected to significantly change during the "twenty year planning timeframe" of the RBES. A survey of land use plans in the region revealed that unless SRS obtains missions beyond what is currently planned, there could be a downturn in regional growth. However, within the context of the twenty-year planning timeframe, little change in population, economy, or land is anticipated.

There may be changes in the CSRA due to new transportation corridors, relocation of businesses to the area, etc. However, it is not expected that these activities will significantly affect SRS or the lands adjacent to it. This future growth will occur nearer to population centers (where the markets and workers are) and transportation corridors (to more efficiently move raw materials and finished goods). Finally, because of the abundance of land for growth and other land uses, there is little expectation that SRS land or that near it will be in high demand in the future, thus necessitating new infrastructure and other upgrades in the immediate area.

2.3 Regional Planning Interface

SRS has maintained a close relationship with planning groups, local governments, Councils of Government, and economic development organizations. Site planners have been active in sharing site plans and site planning techniques with these groups. They also provide tours and information and local planners have reciprocated these activities. This close interaction has produced strong cooperation, which has resulted in site and regional planners being current on each other's plans, thus eliminating the need for extensive education whenever new plans are created.

Many regional planning groups were contacted during the development of this RBES to assess regional planning activities. These groups include the following:

<u>South Carolina</u>

- Aiken County Planning Department
- Aiken-Edgefield Economic Development Partnership
- City of Aiken Planning Department
- Lower Savannah Council of Governments (Responsible for planning for six counties in South Carolina – all within 70 miles of SRS - Aiken, Allendale, Bamberg, Barnwell, Calhoun, and Orangeburg counties)
- North Augusta Department of Economic Development
- Tri-County Alliance (Allendale, Barnwell and Bamberg counties)

<u>Georgia</u>

- Augusta-Metro Chamber of Commerce (Includes Columbia and Burke counties)
- Augusta-Richmond County Planning Department
- Central Savannah River Area Regional Development Center (supports 14 Georgia counties in the region – including those in the SRS vicinity – Augusta-Richmond, Burke and Columbia)
- Columbia County Planning Department

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3.0 SAVANNAH RIVER SITE SPECIFIC RBES DESCRIPTION

3.1 Physical and Surface Interface

3.1.1 Key Features

See Appendix A for Figures /Maps that support this Savannah River Site Specific RBES Description.

- **Watersheds**

There are five main watersheds that originate on, or pass through the Savannah River Site (SRS) before discharging into the Savannah River/Floodplain Swamp. These include the following:

- Upper Three Runs Watershed
- Fourmile Branch Watershed
- Pen Branch Watershed
- Steel Creek Watershed
- Lower Three Runs Watershed

All of these watersheds, including the portion of the Savannah River adjacent to SRS, and the stream/wetlands associated with the Integrator Operable Units (IOUs), integrate the potential contamination discharged to surface water or groundwater from SRS operations. The IOUs are the primary pathways for off-site transport of site related contamination.

Additional information for each watershed and associated IOU can be found in Chapter 4, *Hazard Specific Discussion*.

- **Administrative**

The U. S. Government established the Savannah River Site in 1951 for the production and processing of nuclear materials for national defense requirements. The Department of Energy (DOE) manages SRS as a controlled area with limited public access. Located in south central South Carolina, SRS occupies an area of approximately 310 square miles. The Savannah River forms the site's southwestern boundary for 27 miles on the South Carolina-Georgia border, and the center of the site is approximately 22.5 miles southeast of Augusta, Georgia and 19.5 miles from Aiken, South Carolina, the nearest population centers. The site includes portions of Allendale, Aiken, and Barnwell Counties.

SRS is located approximately midway between South Carolina's piedmont mountains and the Atlantic Ocean. The area is often referred to as the "Sand Hills." Topographic relief at SRS ranges from the long, narrow, steep areas on slopes on the east side of Upper Three Runs Creek and Tinker Creek to the nearly level areas on stream terraces west of SC Highway 125. Elevation ranges from about 420 feet above sea level near the Aiken security gate (northern part of the site) to 70 feet where the Lower Three Runs Creek enters the Savannah River (southeastern part of the site). Most of the drainage from SRS is into the Savannah River; a small portion of the site drains to the Salkehatchie River.

SRS is located on the Atlantic Coastal Plain. The sediments are stratified sand, clay, limestone, and gravel that dip gently seaward. Some soils in the upland area and along the major streams are well-drained to excessively drained. Soils on bottom land range from well-drained to very poorly drained.

The entire site is designated as a National Environmental Research Park (NERP) used by ecology, forestry, and archaeology groups. Scientific investigators from universities, colleges, and other research organizations use SRS as an outdoor laboratory for the study of the impact of man's activities on the environment.

The original facility layout of SRS was designed to isolate major radioactive operations near the center of the site. This design created a buffer zone that reduces the risk of accidental exposure to the general public and provides security for the site.

<u>Administrative Facilities</u>

The administrative facilities provide office space, general training, and records storage for SRS personnel to conduct normal business operations in support of the site's missions.

A Area and B Area are the primary administrative areas. Administrative facilities are also located in each process area to provide office space for personnel who support the area's specific functions.

Specific details for each site facility area are discussed in Chapter 4, *Hazard Specific Discussion*.

- Non-nuclear Facilities

Non-nuclear facilities include Central Shops (N Area), Heavy Water (D Area), and the Savannah River Technology Center (SRTC). Central Shops houses construction and craft facilities, such as fabrication and welding shops and associated materials in support of construction services. This area houses the primary warehouse facilities: storage facilities for operations and maintenance materials, including supplies and spare parts.

The Heavy Water facilities in D Area were actually "dual use" because these facilities had significant nuclear and non-nuclear operations. D-Area contained facilities for supporting heavy water coolant/moderator to the reactors. Heavy water purification facilities, an analytical laboratory, and a powerhouse were operating in the area. This area is essentially closed now.

SRTC conducts research, development, and technical support activities. Laboratory operations are conducted in A Area and formerly in TNX, which is under closure. SRTC also has nuclear facilities within A Area.

- Nuclear/Radiological Facilities

Nuclear/radiological facilities at SRS include the following:

Fuel/Target Fabrication (300 Area) – Formerly metallurgical/foundry facilities for fabricating fuel and target elements for SRS reactors are located in the 300 Area (M Area). Currently this area is undergoing closure activities.

Nuclear Production Reactors (100 Area) – Five reactors for nuclear production originally were built at SRS. All five reactors – C, K, L, P, and R – are classified as surplus facilities and are being evaluated for deactivation and decommissioning. Fuel storage basins in L Reactor contain spent nuclear fuel, awaiting disposition.

Nuclear Materials Processing Facilities (200 Area) – The processing, stabilization, separation, and recovery of nuclear materials are currently only being performed in H-Area facilities. F-Area facilities formerly performed this work, but most of F-Area is undergoing closure activities. Both F and H Areas have a large, shielded canyon building for processing irradiated materials, glovebox facilities for product finishing, and associated support facilities. In addition, F Area contains an analytical laboratory, the Plutonium Metallurgical Building, and the Naval Fuel Facility. The facilities are also in the closure process. H Area contains the Receiving Basin for Offsite Fuels, which is also in the closure mode.

Tritium Facilities – Located in H Area, the tritium recycling facilities will continue at SRS and include recycling weapon components for the active stockpile and extraction of tritium from remaining irradiated targets.

Waste Management Facilities – High level waste (HLW) tanks are located in F and H Areas. In S Area, the Defense Waste Processing Facility immobilizes the high activity portion of HLW in glass. The Saltstone Facility (in Z-Area) and Effluent Treatment Facility are also located in H Area.

Solid Waste Disposal Facility – Solid waste is centrally located in a 195-acre complex in G and E Areas. These facilities store and dispose of radioactive solid wastes and include the Low Level Radioactive Waste Disposal Facility, Transuranic Waste Storage Pads, and the Mixed Waste Storage Buildings.

- **Transportation and Infrastructure**

- Transportation

SRS's transportation network consists of approximately 130 miles of primary, 1100 miles of secondary roads, and 33 miles of railroad. The roadways serve to provide access for 20,000 vehicle trips per day (employees driving to and from work and employees driving between site areas), shipment of radioactive and hazardous materials between areas, access to test wells, utility lines, research sites, and natural resource management activities. Westinghouse Savannah River Company (WSRC) maintains primary roads and the U.S. Forest Service maintains the secondary roadways.

The railroads support delivery of foreign fuel shipments, movement of nuclear material and equipment onsite, and will support delivery of construction materials for new mission projects. Materials and products transported by rail to or from SRS are shipped by CSX Transportation, which has access throughout the United States, Canada, and Mexico. No tunnels or underpasses restrict the transportation of tall or wide loads.

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Both roads and railroads are undergoing evaluation to reduce costs. For example, railroad operation shifts will be reduced from two to one and WSRC will continue to close unneeded track sections, reduce railroad tie replacements, transfer railroad shipments to road shipments, etc., with plans to abandon SRS railroad system after the last shipment of depleted uranium oxide waste drums to Envirocare, Utah (by FY2006).

- Dams

There are 12 SRS dams, all of which are on the Federal Energy Regulatory Commission (FERC) Dam Inventory list. Two dams (PAR Pond and Steel Creek) are classified as High Hazard dams while the other 10 (Pond A, Pond B, Pond C, Pond 2, Pond 4, Pond 5, skin face, old fire pond, new fire pond and A01 dam) are Low Hazard. All ponds are subject to annual inspections by FERC. The function of SRS dams will continue indefinitely to contain radioactive sediments and to support biological, environmental, and ecological research.

- Steam

The SRS Steam System provides process steam to SRS buildings and facilities in support of the site's missions and in compliance with appropriate regulations and standards. Steam is generated and distributed from facilities in A, D and K Areas with a facility in H Area now in standby condition. The D-Area steam generation is run by the South Carolina Electric and Gas Company (SCE&G). The total design capacity of all steam generating facilities is almost 15 million lbs/yr.

- Domestic Water

The Domestic Water System produces and distributes all domestic water to the SRS population in compliance with state and federal regulations. Water quality is governed by the Secondary Water Quality Standards. Included in domestic water systems is the production and distribution of bottled water.

Domestic water is drawn from 20-inch diameter production wells using vertical turbine pumps that are installed in the aquifer approximately 700 feet below grade. Most of the domestic water produced is used directly by the SRS workforce population; however, some domestic water is used for equipment cooling, fire protection water, and as make up water to cooling towers.

Before 1997, each SRS area had individual domestic water systems, totaling 28 independent systems. To implement the new regulatory requirements of the Safe Drinking Water Act, many of the individual systems were consolidated. Now the site has 18 domestic water systems, including three large systems that supply 98% of the site's domestic water requirements. The three large systems have water treatment facilities located in A, B, and K Areas. The B-Area treatment facility is a stand-by for the A-Area facility. Well water is treated in the large treatment facilities with either soda ash or caustic to adjust the pH, phosphate to reduce corrosion, and sodium hypochlorite as a disinfectant.

The domestic water distribution systems have approximately 32 miles of intra-area distribution piping and 26 miles of inter-area distribution piping with five elevated storage tanks.

- Firewater System

The Firewater System provides reliable firewater supply and distribution systems within all the operating areas in support of safety, facility operations and loss prevention at the SRS in compliance with appropriate codes and standards. Within the SRS Firewater System are 16 water supply and distribution systems which in turn supply 245 water-based fire suppression systems as well as approximately 1,500 fire hydrants, valves and curb boxes used by the SRS Fire Department for manual fire fighting.

Sixteen fire protection water supply and underground distribution systems support the operating areas of SRS. A reliable fire protection water supply is crucial to ensure life safety. In addition, these systems ensure against vital program interruption, safety class equipment (and containment provisions) damage, property and monetary losses and release of radiological or other hazardous material from fire.

A few of the fire protection water supply and distribution systems have been in service since the early 1950s. The other systems have been installed and/or modified within the last 10 years. Piping materials range from unlined cast iron in the 1950s, to concrete-lined cast and ductile iron, to PVC pipe in current installations. Pumping systems have improved from manually operated steam turbines to electric and diesel driven fire pumps in dedicated pump house facilities.

- Process/River Water System

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The mission of the Process/River Water System is to produce and provide process water to facilities throughout the SRS in support of facility operations and site missions. This support is required to be reliable, in compliance with applicable regulations, and cost effective. The current average demand for process water is 2,400 gallons per minute (gpm) with an additional 285,000 gallons of deionized water produced each month in direct support of SRS missions. The river water system now supplies 5,000 gpm of river water primarily to L Lake and also to K Area, L Area and Par Pond as required.

The SRS Process Water Systems have been in operation across the site for over 45 years. Components of these systems include process water wells, process water distribution systems, deionized water systems, chemical treatment facilities and the river water system. With minor exceptions, the basic configuration of the process water systems has remained unchanged since their original installation. Process water is used to provide water for once-through cooling, as a supply of make-up water for cooling tower water systems, as a feed to deionizers, which supply deionized water (water treated to remove both anions and cations) to boilers and other applications as a water supply for fire water storage tanks and for flushing and wash-down.

The river water system was installed in the early 1950s to provide cooling water to the five SRS production reactors. The system consisted of, basically, a distribution system of 50 miles of large, 46-inch to 84-inch diameter pipe and three pump stations each with ten 25,000 gpm pumps. With reactor cooling water no longer required, two pump stations have been retired with the third now providing water to, mostly, maintain the level of L Lake and, in times of drought, Par Pond. Reduced requirements and funding limits have caused system maintenance to be sharply reduced. The system itself, however, remains functional as determined by a comprehensive review performed in 1996.

- Sanitary Wastewater System

The Sanitary Wastewater Systems provide for the collection, treatment, and discharge of sanitary wastewater effluent within South Carolina Department of Health and Environmental Control (SCDHEC) and National Pollutant Discharge Elimination System (NPDES) outfall limits for the SRS population. These systems include a central treatment facility capable of handling over 1,000,000 gallons of sanitary wastewater each day, five smaller treatment plants, 58 miles of sewer pipe and 44 lift stations.

Ninety six percent (96%) of the SRS sanitary wastewater is treated at the Central Sanitary Wastewater Treatment Facility (CSWTF). The CSWTF is located on Burma Road and was installed in 1994-95. The original design capacity of approximately 1,050,000 gpd was for a much larger site population of approximately 30,000 employees. The current CSWTF average flow rate is approximately 18% of design capacity. This flow rate reduced organic loading has presented a few operational issues. The facility receives sanitary wastewater transported through an inter-area collection system.

The inter-area collection system was also installed in 1994-95 and consists of 18 miles of mostly pressure sewer line and 12 additional lift stations necessary to transport the sanitary wastewater to the CSWTF. This system collects the sanitary wastewater from the A, B, C, E, F, H, M, N and S Areas of SRS. The remaining 4% of the SRS sanitary wastewater is generated and treated at smaller, independent, treatment facilities located in the remote areas of D, TNX, L, K and P Areas.

Many of the intra-area sanitary wastewater collection systems were installed when SRS was constructed in the early 1950s and includes about 40 miles of mostly gravity sewer pipe.

- Electrical Distribution System

The Electrical Distribution System in each area provides a reliable source of electrical power to all SRS processes and facilities in compliance with appropriate regulations and standards. The major equipment associated with the electrical distribution systems includes switchgear, transformers, reclosers, overhead lines and underground cables. There are approximately 114 miles of overhead line (including 3000 poles, 299 pole mounted transformers and associated hardware), 18 miles of underground cable, four automatic reclosers, and 369 pad transformers (includes switchgear and associated hardware).

SRS electrical power is supplied, under contract, from the South Carolina Electric & Gas (SCE&G) 115 kilovolts (kV) Transmission System. The contract specifies demand levels, energy rates and operating protocol for electrical power supplied to SRS. The 115 kV power supply is transformed to a medium voltage level, typically 13.8 kV and then

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distributed to the site distribution systems by WSRC. The transmission and distribution systems at SRS provide a reliable source of power to all processes and facilities on the site. Electrical power for SRS is provided from three high voltage lines:

- South Carolina Electric & Gas - 1 with a capacity of 160 megawatts
- South Carolina Electric & Gas - 2 with a capacity of 160 megawatts
- South Carolina Electric & Gas - 3 with a capacity of 336 megawatts

The electrical power is transmitted throughout the site at 115,000 volts (115 kV). The 115 kV transmission system consists of wooden poles, phase conductors, static wires, insulators, pole line hardware, switching stations, and substations. The 115 kV transmission system substations and lines are arranged in interconnecting loops, which provides SRS process areas and facilities with redundant sources of power.

- <u>Emergency Services</u>

The site has a comprehensive emergency management program that covers all phases of emergency planning, mitigation, preparedness, response, and recovery. The level of support to any area, facility, or division is driven by the hazards involved and by the impact to the worker, the general site population, the off-site population, and the environment.

SRS maintains a fully manned, equipped, trained and qualified fire department capable of responding to fires, medical emergencies, hazardous material emergencies, and rescue situations. Three stations are located on site. Fire Protection Systems are established, implemented and maintained throughout the site facilities in support of life safety, loss prevention and continued facility operations. In order to effectively support existing and future site missions, these systems must be maintained in an operable, reliable and code compliant condition.

SRS also has a round-the-clock Emergency Operations Center (EOC) and Savannah River Site Operations Center (SRSOC), which are located in the basement of 703-A. The EOC is a dedicated emergency response facility. The SRSOC is a continuously manned 911 facility, which also houses the Fire Alarm Computer System.

- <u>Endangered Species</u>

The site is currently restoring native vegetative communities and species, including red-cockaded woodpecker habitat, hardwood habitat, pine-savannahs, and wetlands. In addition, this restoration will protect water quality by stabilizing soil and minimizing industrial area runoff through engineering and vegetative management techniques. Carolina bays and the site's dominant natural vegetation, longleaf pine savannahs, are being restored and restoration is proceeding where it's compatible with ambient soil conditions. Prescribed burning operations continue to enhance wildlife habitat, facilitate post timber- harvest regeneration, and reduce forest fuels. Soil and watershed maintenance and stabilization provide infrastructure support to the SRS industrial areas. Natural resource research projects cover a wide range of topical areas, including short rotation woody crops; biodiversity; prescribed fire and smoke management; wetland, pine savannah, and hardwood restoration; and endangered species recovery.

In June 1999, DOE designated 10,000 acres of the Savannah River Site as a biological and wildlife refuge, creating the Crackerneck Wildlife Management Area and Ecological Preserve. The South Carolina Department of Natural Resources manages the reserve (under a long-term lease) and associated deer hunts and maintains the site's wild turkey populations.

SRS provides habitat for four federal endangered species, the red-cockaded woodpecker, wood stork, shortnose sturgeon, and smooth purple coneflower, and two federal threatened species, the bald eagle and American alligator. Planning for habitats for these species is important because available current and future land use in the immediate vicinity of federally threatened or endangered species is limited. Other site species require consideration because the protection and management philosophy for the DOE Research Set-Aside Areas states that they are for research; should receive as little management as possible; should be protected to remain as natural as possible with little or no human influence; and are primarily for non-manipulative research. These areas also function as "control areas" in evaluating the effects of SRS operations and forest management activities. The largest of these areas is the E. P. Odom Wetland Set-Aside, which includes the northern section of the Upper Three Runs Creek watershed and is specifically protected by the SRS Stream Management Policy. The Research Set-Aside Areas total 14,005 acres, about seven percent of the site. These areas are excluded from most routine maintenance and forest management activities. The Research Set-Aside Areas were selected to represent most of the site's major habitat types and include old fields, sandhills, upland hardwoods, mixed pine/hardwoods, bottomland forests, swamp forests, Carolina bays, and fresh water streams and impoundments.

- **Surface Contamination**

SRS has identified 515 inactive waste units and 1013 facilities for deactivation and decommissioning. In addition, many of the streams and creeks have some contamination due to run off from production facilities or the use of surface water for cooling water. Additional details can be found in Chapter 4, *Hazard Specific Discussion*.

3.1.2 Differences Between Current State, PMP End State Plan, and Vision end State

While it is anticipated that some of the infrastructure will not be needed in the future, some level of infrastructure will be needed after the Vision End State. For example, railroads will be phased out as end states are reached, but some roads will be necessary for remaining site employees for continuing National Nuclear Security Administration (NNSA) missions, for potential new missions and for monitoring and long-term stewardship. For NNSA missions and depending on potential new missions for SRS, water, electricity, and other utilities will still be needed in certain areas. In addition, the dams will need to be maintained indefinitely to contain radioactive sediments and to support biological, environmental and ecological research. The need for emergency services, including the site's fire department and the Emergency Operations Center will remain; however, these may be at a reduced level by the 2025 end state.

3.2 Human and Ecological Land Use

3.2.1 Key Features

Land Uses

Except for site facilities, SRS land cover is a wide variety of natural vegetation types with more that 90 percent in forest land. Open fields and pine and hardwood forests comprise 73 percent of the site; approximately 22 percent is wetlands, streams, and two lakes; and production and support areas, roads, and utility corridors account for the five percent of the total land area. SRS includes several production, production support, service, research and development, and waste management area.

3.2.2 Differences Between Current State, PMP End State Plan, and Vision end State

SRS land has been and will continue to remain under federal ownership. Land cover will remain as a wide variety of natural vegetation types with more than 90 percent in forest land. In addition, the 22 percent of the site that is wetlands, streams and two lakes will continue through the Vision end date. The PMP planned that 72 facilities would have been deactivated and decommissioned by 2006, and 515 inactive waste units remediated by 2026. The Vision End State plans for 1,013 facilities to be deactivated and/or decommissioned and all 515 inactive waste units remediated. Many of these facilities and inactive waste units will remain in situ, leaving the percentages for natural vegetation; wetlands, streams and lakes; and production and support facilities to be similar to current state. For example, reactor buildings, canyon facilities, and high level waste tanks will deactivated and decommissioned in situ. Since these types of facilities are the largest facilities on the site, the percentage for production and support facilities will remain the same.

Protection of federally endangered species and wildlife habitats will continue beyond 2025. Ecological research will also continue.

3.3 SRS Legal Ownership

3.3.1 Site Ownership – Current and 2025 End State

The site is owned by DOE and operated by an integrated team led by WSRC. The 2025 End State plans for continued federal ownership of the land, most likely the Department of Energy. Currently, there are NNSA missions that may extend beyond the 2025 window. This follows the recommendation of the Citizens Advisory Board Recommendation #8 made in 1995 and previous land use plans. The land was formerly owned by individual farmers and landowners, and there has not been any industrial/manufacturing interest in private ownership of the land because the site is located in a remote, rural area.

In addition, federal law requires that any excess land and/or facilities must be turned over the Bureau of Land Management. This Bureau looks for other federal agencies that might have a use for the land, and then any state agency or municipality before it could be considered for sale to the public. However, to do so, the land and facilities would need to be remediated to residential standards.

3.3.2 Surrounding Site Ownership

As discussed in Chapter 2, the land use surrounding SRS primarily includes residential, light industry, heavy industry, and recreation. Land surrounding the site is owned by both private individuals and companies. In 2025, it is expected that the land use and ownership will be similar to current land use and ownership.

3.4 SRS Demographics

Major SRS employers include the following: (The number of employees shown is as of March 15, 2004.)

Department of Energy –Savannah River (DOE-SR), which provides management and oversight for non-National Nuclear Security Administration activities. There are approximately 385 DOE-SR employees at SRS.

Department of Energy – National Nuclear Security Administration, which provides management and oversight for NNSA activities. There are approximately 32 DOE-NNSA employees at SRS.

Westinghouse Savannah River Company, with Bechtel Savannah River Company, British Nuclear Fuel Limited, BWXT, CH2M Hill, and Polestar, which manages and operates SRS for DOE and NNSA. WSRC and its partners have approximately 11,378 employees at SRS.

Wackenhut Services, Inc. (WSI), which provides and manages the site security force. WSI employs approximately 891 employees at SRS.

Savannah River Ecology Laboratory (SREL) which provides site ecological evaluations and research. The University of Georgia, which manages SREL, employs approximately 202 employees.

Savannah River Forest Station (SRFS), an independent unit of the United State Forest Service, which manages the site’s natural resources. There are approximately 199 SRFS employees at SRS.

Other employers include the University of South Carolina Institute of Archaeology and Anthropology, the U. S. Department of Agriculture’s Soil Conservation Service, and the South Carolina Fish and Wildlife Service.

The number of employees will change considerably over the next 20 years as end states are reached. WSRC may or may not be the management and operating contractor, in fact, a new contract format may be in operation at the time. The WSI contract will also be available for renewal or rebid during the timeframe of this Vision. While the need for security for DOE-SR missions will decrease over time as end states are reached, there will be a need for additional security for the Mixed Oxide (MOX) facilities for the disposition of excess DOE Complex plutonium and if new missions are assigned to SRS. It is anticipated that SREL and SRFS will maintain their presence at SRS and will continue the same missions that they current have.

3.4.1 Surrounding Site Demographics Differences Between Current and 2025 End State

A careful examination of economic development plans for the region indicates normal growth expected in metropolitan counties in the region. There are no major changes to the demographics surrounding the site anticipated by the 2025 End State.

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4.0 HAZARD SPECIFIC DISCUSSION

See Appendices B, C and D for supporting figures, maps and tables.

Key Features

- **Chapter Purpose**

Chap 4 will only address Site Category hazards related to CERCLA & RCRA cleanup (~13% of Cleanup baseline) for Inactive Waste Units (S&G), EM Facility D&D and on-site permanent waste disposal (burial grounds, Saltstone vaults, MWMF, Sanitary landfills) per the Guidance. Nuclear Material and other Waste Site Hazard Categories will not be addressed in Chap 4.

Objective and Methodology

- **Hazard Hierarchy Approach for Soil and Groundwater**

The objective of Chapter 4 is to provide the greatest level of detail at the most appropriate scale of SRS hazards and their respective end state. SRS hazards are defined by Soils and Groundwater Project (SGP) waste units or EM facilities. SRS has elected to present all individual hazards for the SGP and Deactivation and Decommissioning (D&D) programs through tables, maps, and Conceptual Site Models (CSMs) at the appropriate watershed or area scale. The watershed scale is used to depict groundwater plumes and facilities in the general site area (G Area). This scale is appropriate for these two hazards due to the extensive area that groundwater plumes encompass and the fact that G-Area facilities represent the remaining area within a watershed outside of site process or industrial areas. The area scale is appropriate to focus on hazards associated with an industrial area or respective process. This includes hazards both inside and nearby area perimeters. Areas (or appropriate portions of areas) are then presented in their respective IOUs. IOUs are contained within their respective watersheds identified by the same name (see Appendix B *Watershed Maps, Conceptual Site Models, and Hazard Tables*, Figures 4.1b to 4.6b Watershed/IOU CSMs). Figure 4.0, *SRS Sitewide Conceptual Site Model*, in Appendix B, provides a high-level (greatest scale) SRS sitewide CSM that shows the relationship between the individual watersheds/IOUs, industrial/process areas, and the eventual receptor of the Savannah River and Savannah River Floodplain.

Integrator Operable Units (IOUs)

IOUs are the surface water bodies cutting across all six of the site's watersheds. As the term implies, IOUs are the integrators of potential contamination discharged to surface water or groundwater, including the Savannah River floodplain and any contiguous wetlands. These units represent possible paths of contamination from SRS activities to offsite receptors and the environment. As such, the IOU program, as established by SRS, is designed to accomplish the following:

1) assess their risk levels and any ongoing impact from active and inactive waste units across the site,
2) identify and implement any needed early actions; and
3) complete final regulatory assessment and monitor previous remedial actions as necessary.

The contractors and stakeholders associated with SRS environmental cleanup have long recognized that the five major site streams and their associated flood plains and wetlands, along with the Savannah River Swamp form primary hydrologic pathways for contaminant migration from SRS to the Savannah River. As far back as 1995, these pathways were identified as Integrator Operable Units (IOUs). Each stream is called an IOU because it integrates the effluent from the Operable Units within its watershed. SRS has six IOUs (Fourmile Branch, Lower Three Runs, Pen Branch, Savannah River Floodplain Swamp, Steel Creek, and Upper Three Runs). Several are contaminated from past releases direct to the streams. In addition, some IOUs receive contamination from past spills, leaks, etc. that impacted groundwater which now outcrops into the IOUs. Working in conjunction with EPA, SCDHEC, and the CAB, DOE-SR and WSRC established the IOUs as specified Waste Units and included them in Appendix C of the Federal Facility Agreement (FFA). This action formally launched their cleanup and provided a means of tracking progress in their assessment and remediation.
This innovative IOU cleanup approach is based on sound reasoning and strategic planning to accelerate whole area closure. Remediation of the majority of SGP's inactive waste units involves addressing discreet entities requiring specific assessment and various means of remediation. The Integrator

Operable Units augment these actions by providing a common sense approach to effectively address SRS cleanup by looking at the Site on a more comprehensive scale. By focusing on the site's primary tributaries to the Savannah River, the IOUs address the watersheds that comprise the whole of SRS's 300-square miles of surface area. The IOUs provide an effective protective strategy for SGP's cleanup effort. As such, this ongoing assessment and remediation function enables long-term monitoring for the various surface pathways against the potential release of hazardous substances from Operable Units within a watershed to other receptors. Further, as early action opportunities are unveiled, the assessment of these IOUs serves to provide near term protection of human health and the environment.

It should be noted that the area scale maps provide information/data that align with area function and boundaries, regardless of watershed influence. In contrast, the area or watershed CSMs depict appropriate hazard(s) impact within their respective watershed boundaries. For areas that are on geographic and/or hydrogeologic divides and influence more than one watershed, a CSM will be provided for each watershed impacted by the area.

- **Hazard Hierarchy Approach for EM Facility Decommissioning**

The SRS EM Integrated Deactivation and Decommissioning Plan was developed as a basis for planning and accelerating closure of EM facilities, waste tanks, and inactive waste sites from 2003 – 2025. The plan presumes no programmatic reuse of any site facilities, including infrastructure by DOE or other federal program. The plan reflects guidance from the *DOE EM Program Performance Management Plan, Top-to-Bottom Review*, DOE guidance regarding risk-based ranking, and DOE/WSRC Contract Modification 100. The plan also defines the EM end states for facilities, waste tanks, and inactive waste sites. Reflecting its comprehensive purpose, the D&D plan integrates strategic plans from SRS programs, maintains a repository of facility information, including rough order-of-magnitude (ROM) cost estimates, hazard category, and end state; and provides the methodology for the scheduling of facility closure, based on economic, health and safety, and programmatic risks.

Each area description has an EM Facility D&D table (see below) that summarizes the Total EM facilities in the area (by Facility Hazard type, Number of facilities and Sq Ft), the Current Status of D&D Completions through FY03 (Number of facilities where D&D is complete) and the planned 2025 End State for final decommissioning (number of facilities Demolished or In Situ Decommissioned). The D&D End State assumes all EM facilities will be decommissioned and none will be reused by DOE or other federal program. The information presented for facilities in each area was obtained directly from the SRS EM Integrated D&D Plan (Rev. 1) and is consistent with the total listing of EM Facilities in the WSRC contract. Additional information related to EM Facility hazard types, conceptual site models and decommissioned end states is available in Appendix D, Conceptual Site Models for Typical Hazards.

Site Totals			**Current Status**	**End State**	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	144	3,916,656	0	111	33
Rad	38	901,683	0	30	8
Oth Ind	780	6,541,246	24	716	64
HLW Tanks	51	N/A	2	0	51
Total	1013	11,359,585	26	857	156

End State for Soil and Groundwater Cleanup

All SRS soil remediations are currently and projected to accommodate the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) cancer risk assessment levels of either less than one in a million (< 10^{-6}) for a residential (unrestricted) scenario or between a one in ten thousand to one in a million (10^{-4} to 10^{-6}) industrial worker scenario with institutional controls. A corollary approach is implemented for non-cancer risk (presented in terms of hazard indexes) but is not presented to simplify SRS's end state concept. Evidence of this is depicted for the completed units on Tables 4.1a, Risk Based End State (*RBES) Planned End State By Watersheds (G Area Only),* and 4.3a, *RBES Planned End State by Areas* in Appendices B and C, with the end state for all complete SGP units identified by one of the aforementioned risk categories.

SRS water (i.e., groundwater and surface water) hazards, and resultant cleanup strategies, are typically

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not based on a risk-based end state, but rather maximum contaminant limits (MCLs). MCLs are the highest level of a contaminant that is allowed in drinking water which includes the surface or subsurface source of supply. MCLs are enforced through the South Carolina Primary Drinking Water Regulations for monitoring, reporting, record retention requirements and public notification. The end state for SRS waters is to remediate the media until such time that it meets MCLs throughout the entire contaminated volume of water. In addition, SRS utilizes Mixing Zones, which are essentially temporary permits to exceed MCLs in a portion of a plume to allow a remedy (active or passive) to have the necessary time to achieve MCLs throughout an aquifer. SRS does not foresee a change to this groundwater remedial strategy. SRS does apply the following graded approach when pursuing the groundwater end state:

1) aggressive/active remediation technologies to eliminate or control source of contamination (e.g., pump and treat, in situ destruction, aggressive immobilization);
2) moderately aggressive remediation alternatives or a combination of active and passive remedial measures for the primary groundwater plume (e.g., barrier walls, recirculation wells); and
3) passive and innovative technologies (e.g., monitored natural attenuation, phytoremediation).

This strategy is essential in that it is technically impracticable and cost prohibitive to actively remediate all SRS waters to MCL levels. Furthermore, this strategy maximizes short-term cost expenditures on high concentration/source reduction groundwater contamination and relies on long-term natural, passive means on the least contaminated portion of groundwater plumes.

It is evident that SRS has utilized and benefited from the graded approach when one compares the CERCLA and Resource Conservation and Recovery Act (RCRA)/CERCLA waste units that have either Interim or Final Record of Decisions with a component of the remedy that is defined as a Mixing Zone, Monitored Natural Attenuation, and/or passive remediation. These include:

- passive soil vapor extraction with monitoring at Miscellaneous Chemical Basin/Metals Burning Pit and A-Area Burning/Rubble Pits;
- mixing zones at D-Area Oil Seepage Basin, Old F-Area Seepage Basin, and L-Area Burning/Rubble Pit/Rubble Pile/Gas Cylinder Disposal Facility;
- monitoring at D-Area Burning Rubble Pits, and C, F, K, P-Area Coal Pile Runoff Basins;
- monitored natural attenuation at K-Area Burning/Rubble Pit; and
- passive remediation with natural biodegradation at P-Area Burning/Rubble Pit.

SRS has made gross estimates of the volume of groundwater addressed by these low energy/passive approaches and compared this volume to a hypothetical active remedy (i.e., pump and treat) applied to the same volume. Applying broad assumptions in support of the comparison, SRS has used these alternative approaches for active remediation to address more than 3 billion gallons of groundwater. To put this quantity in perspective, the National Mall in Washington, D.C., is roughly 309 acres; 3 billion gallons of water would submerge the entire mall to a depth of approximately 30 feet.

Furthermore, SRS has virtually institutionalized the graded approach for all of the groundwater remediations conducted under the RCRA program. These include the following:

- phytoremediation for the Mixed Waste Management Facility Groundwater,
- bioremediation with Mixing Zone for the Sanitary Landfill Groundwater,
- barrier walls with base injection for the F&H Seepage Basin Groundwater, and
- passive soil vapor extraction for the A/M Area Groundwater.

These efforts will result in remediation of billions of gallons of groundwater through passive remediation, and/or natural processes in place of more aggressive remediation technologies.

Hazard Types

Due to the number of hazards, the similarities of process history, physical and/or chemical characteristics, and the similar approach in mitigating these hazards, SRS has elected to categorize all waste units and D&D facilities by hazard types (e.g., radiological seepage basins, ash basins, inactive process sewer lines, etc.) to facilitate presentation of end states. Appendix D, *Conceptual Site Models for Typical Hazards*, provides descriptions and logic of

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soil and groundwater and D&D hazard-type groupings and respective hazard-type CSMs. The CSMs depict the typical remediation technologies identified for each impacted media (e.g., soil, sediment, surface water, and groundwater). In addition, a crosswalk table for each area has been provided that correlates individual hazards (i.e., waste units) that have yet to be remediated to one of the hazard types. (See Appendix B, *Watershed Maps, Conceptual Site Models, and Hazard Tables*, Table 4.2, *Risk-Based End State Hazard Type Crosswalk for Watershed "To Go" Units in G Area* and Appendix C, *Area Maps and Conceptual Site Models and Hazard Tables*, Table 4.4, *Risk-Based End State Hazard Type Crosswalk for Watershed "To Go" Units.*) Units where remediation is not complete are referred to as "to go" units. The remedial approach to achieve the end state is anticipated to remain consistent between the current and Risk-Based Vision and risk management decisions agreed to by the Environmental Protection Agency (EPA), South Carolina Department of Health and Environmental Control (SCDHEC) and DOE. The deviation from current end state is dependent upon the risk scenario and corresponding risk calculations that support this scenario. (See Appendix E, *Exposure Scenario Modification discussion*.)

4.1 Hazard Specific Discussion by Watersheds

There are five main watersheds that originate on, or pass through the SRS before discharging into the Savannah River/Floodplain Swamp. The SRS hazard evaluation is comprised of the five on-site watersheds (Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, Lower Three Runs) and the Savannah River/Floodplain Swamp, which is the receiving body for the onsite streams. All of these watersheds, including the portion of the Savannah River adjacent to SRS, and the stream/wetlands associated with the IOUs integrate the potential contamination discharged to surface water or groundwater from SRS operations. The IOUs are the primary pathways for off-site transport of site-related contamination. A general site-wide conceptual site model is provided in Figure 4.0, SRS Sitewide Conceptual Site Model, depicting sources of contamination and contaminant migration pathways.

The hazard information presented in the following pages is segregated in watershed-level and area-level discussions. The sections are organized to avoid duplication of area hazard information that impact more than one watershed. G-Area (general site) hazards (including the IOUs) are generally located outside of specific areas and are therefore addressed within each watershed level discussion presented in Sections 4.1.1 – 4.1.6. The conceptual site models (CSMs) for the watershed level discussions show G-Area units and IOUs that are "to go." Each area hazard (i.e., A Area, B Area, etc.) is presented individually beginning with Section 4.2.1 and includes the soil and groundwater hazards within the respective area. Figures in Appendix B, *Watershed Maps, Conceptual Site Models and Hazard Tables*, and Appendix C, *Area Maps, Conceptual Site Models and Hazard Tables*, are provided that show "complete" and "to go" units visible within the extent of the figure. CSMs are provided in the area-level discussions and reflect "to go" units only.

4.1.1 Upper Three Runs Watershed

Watershed Description

Upper Three Runs (UTR) originates northeast of the SRS boundary and follows a southwesterly direction for approximately 30 kilometers (km) (19 miles) within the SRS boundary and discharges directly into the Savannah River approximately 1.5 km (0.9 miles) upstream of the TNX facility. Within the SRS boundary, the Upper Three Runs Watershed drains approximately 250 square kilometers (km^2) (97 square miles [mi^2]). The entire watershed drains about 645 km^2 (245 mi^2). The northern portion of the watershed within the site boundary includes portions of A Area, M Area, and the Savannah River Technology Center (SRTC). The southern portion of the Upper Three Runs Watershed includes the majority of the B-Area Administrative Center, S-Area Vitrification Facility and Z-Area Saltstone Facility, as well as portions of E-Area Waste Management Complex, F and H Separations Areas, and R-Reactor Area. The main tributaries within the SRS portion of the Upper Three Runs Watershed include Tinker Creek and Tims Branch. Smaller tributaries include Crouch Branch, McQueen Branch, and Mill Creek.

Watershed Hazards

Figure 4.1a, *Upper Three Runs Map*, in Appendix B, depicts the UTR Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the UTR Watershed is shown in Figure 4.1b, *Upper Three Runs CSM*, in Appendix B, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End States by Watershed (G Area only*) in Appendix B, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the UTR Watershed that require remediation are located in A Area, B Area, E Area, F Area, G Area (Steed Pond, UTR IOU), H Area, M Area, R Area, and S Area.

Current Watershed Cleanup Status

Table 4.1a, *RBES Planned End States by Watershed (G Area only)* in Appendix B, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, RBES *Hazard Type Crosswalk for Watershed "To Go" Units) (G Area only),* in Appendix B, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the UTR Watershed to a hazard type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2.

Twenty-seven G Area waste units were identified in the UTR Watershed of which 24 are complete. For the remaining three waste units, one is categorized as a Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the UTR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.1.2 Fourmile Branch Watershed

Watershed Description

The Fourmile Branch (FMB) Watershed, which is located entirely within the SRS boundary, originates near the center of SRS and follows a southwesterly direction for approximately 24 km (15 mi). In the lower reaches, Fourmile Branch broadens and flows through a delta that has been formed by the deposition of sediments during reactor operations. The majority of the flow discharges into the Savannah River and a small portion of the creek flows west and enters Beaver Dam Creek. When the Savannah River floods, water from Fourmile Branch flows into the Savannah River swamp. The watershed drains about 57 km^2 (22 mi^2) and includes several SRS facilities: C Area (C Reactor), N Area (Central Shops), F, H, and E Areas (General Separations Areas), and the Solid Waste Disposal Facility. At its headwaters, Fourmile Branch is a small backwater stream that has been relatively unimpacted by historical SRS operations. Fourmile Branch has historically and currently receives effluents from F, H, and C Areas, as well as contaminated groundwater discharges that have migrated from SRS facilities and waste units into the stream and its tributaries.

Watershed Hazards

Figure 4.2a, *Fourmile Branch Map* in Appendix B, depicts the FMB Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the FMB Watershed is shown in Figure 4.2b, *Fourmile Branch CSM*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End States by Watershed (G Area Only)* in Appendix B, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the FMB Watersheds that require remediation are located in C Area, E Area, R Area, G Area (FMB IOU), and N Area.

Current Watershed Cleanup Status

Table 4.1 also provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *RBES Hazard Type Crosswalk for Watershed "To Go" Units (G Area Only),* depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the FMB Watershed to a Hazard Type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the Hazard Type CSMs and Table 4.2.

Four G Area waste units were identified in the FMB Watershed of which three are complete. The remaining waste unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste unit include metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the FMB Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.1.3 Pen Branch Watershed

Watershed Description

The Pen Branch (PB) Watershed originates near the center of SRS and follows in a southwesterly direction for approximately 18 km (11 mi) discharging into the Savannah River floodplain swamp rather than flowing directly into the Savannah River. The PB Watershed is located entirely on SRS property. Pen Branch flows southwesterly from its headwaters, about 3.2 km (2 mi) east of K-Area, to the Savannah River swamp. After entering the swamp, PB flows parallel to the Savannah River for about 8 km (5 mi) before it enters and mixes with the water of Steel Creek about 0.4 km (0.2 mi) from the mouth of Steel Creek at the Savannah River. The PB Watershed drains about 56 km^2 (21 mi^2) and includes the entirety of K Area (K Reactor) and portions of N Area (Central Shops) and waste units associated with L Area (L Reactor). Indian Grave Branch is the principal tributary of Pen Branch.

Watershed Hazards

Figure 4.3a, *Pen Branch Map* in Appendix B, depicts the PB Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the PB Watershed is shown in Figure 4.3b, *Pen Branch CSM* in Appendix B and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End States by Watershed (G Area Only)*, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the PB Watershed that require remediation are located in G Area (CMP Pits, PBIOU), K Area, L Area, and N Area.

Current Watershed Cleanup Status

Table 4.1a, *RBES Planned End States by Watershed (G Area only)* in Appendix B, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the “to go” phase where the response action has not been selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *RBES Hazard Type Crosswalk for Watershed “To Go” Unit (G Area only)* in Appendix B, depicts a crosswalk that categorizes each of the “to go” G-Area hazards and facilities in the PB Watershed to a Hazard Type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2.

Ten G Area waste units were identified in the PB Watershed of which two are complete. From the remaining eight waste units, seven units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits) and one unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the PB Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.1.4 Steel Creek Watershed

Watershed Description

The headwaters of Steel Creek (SC) originate near P-Reactor, southwest of Par Pond. SC flows southwesterly about 3 km (1.8 mi) before it enters the headwater of L Lake. L Lake is 6.5 km (4.0 mi) long with an area of about 418 ha (1034 acres). Flow from the outfall of L Lake dam travels about 5 km (3 mi) before entering the Savannah River swamp and another 3 km (1.8 mi) before entering the Savannah River. SC has received thermal discharges and increased flow from reactor operations that produced an extensive delta where SC enters the Savannah River floodplain swamp. Meyers Branch, the main tributary of SC, flows approximately 10 km (6.2 mi) before entering SC. Meyers Branch is relatively undisturbed by SRS operations. The total area drained by the Steel Creek and Meyers Branch system is about 91 km^2 (35 mi^2) and includes the entirety of P-Area and portions of L-Area.

Watershed Hazards

Figure 4.4a, *Steel Creek Map* in Appendix B, depicts the SC Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the SC Watershed is shown in Figure 4.4b, *Steel Creek CSM* in Appendix B, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End State by Watershed (G Area only)* in Appendix B, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the SC Watershed that require remediation are located in G Area (L Lake, SC IOU), P Area, and L Area.

Current Watershed Cleanup Status

Table 4.1a *RBES Planned End State by Watershed (G Area only)* in Appendix B, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *RBES Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix B, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the SC Watershed to a hazard type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the Hazard Type CSMs and Table 4.2, *RBES Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only),* also in Appendix B.

Nine G Area waste units were identified in the SC Watershed of which six are complete. From the remaining three waste units, one unit is categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit is categorized as Hazard Type 9 (Miscellaneous Sites), and one unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the SC Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker

4.1.5 Lower Three Runs Watershed

Watershed Description

The Lower Three Runs (LTR) Watershed is located on the eastern portion of SRS and lies partially within the SRS boundary. The LTR stream is the principle surface water body within the watershed and is located entirely on SRS property, including the narrow corridor that extends from Patterson Mill to the confluence with the Savannah River (Figure 4.5a, *Lower Three Runs Map* in Appendix B). The watershed, which drains about 460 km^2 (178 mi^2), includes the R-Reactor-Area, a portion of P-Reactor-Area, ecological laboratories and various Soils and Groundwater Project waste sites. Industrial facilities located outside the eastern SRS boundary are also located within the LTR Watershed. A mainstream impoundment, Par Pond, was constructed along with several other retaining ponds on the headwaters of LTR to receive reactor effluent.

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Watershed Hazards

Figure 4.5a, *Lower Three Runs Map* in Appendix B, depicts the LTR Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the LTR Watershed is shown in Figure 4.4b, *Steel Creek CSM* in Appendix B and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End State By Watersheds (G-Area Only)* in Appendix B, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the LTR Watershed that require remediation are located in G Area (LTR IOU, Par Pond), R Area, and P Area.

Current Watershed Cleanup Status

Table 4.1a, *RBES Planned End State By Watersheds (G-Area Only)*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *RBES Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix B, depicts a crosswalk that categorizes each of the "to go" G-Area hazards and facilities in the LTR Watershed to a Hazard Type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2.

Twelve G Area facilities were identified in the LTR Watershed of which five are complete. From the remaining seven waste units, four units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 7 (Sludge Application Sites), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste units include nonradioactive rubble and building debris, metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the LTR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker with institutional controls.

4.1.6 Savannah River / Floodplain / Swamp Watershed

Watershed Description

The Savannah River (SR) Watershed drains about 27,388 km^2 (10,574 mi^2) and includes western South Carolina, eastern Georgia, and a small portion of southwestern North Carolina. Approximately 31% or 8631 km^2 of the watershed area is located in the Coastal Plain that includes Augusta (Georgia), SRS, and the city of Savannah to the Atlantic Ocean. The Savannah River and Floodplain Swamp IOU includes the 100-year floodplain (including the Savannah River swamp) and any continuous wetlands including the Savannah River adjacent and down gradient of the SRS. This area encompasses approximately 72 km (45 mi) from the northern boundary of SRS above Upper Three Runs southward to the U. S. Highway 301 bridge. The five major SRS streams feed into the Savannah River and floodplain swamp (Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs.) The Savannah River and Floodplain Swamp Watershed includes portions of A/M-Area, D-Area, and TNX.

Watershed Hazards

Figure 4.6a, *Savannah River/Floodplain Map* in Appendix B, depicts the SR Watershed and includes all general area (G) waste sites and facilities. The conceptual site model for the SR Watershed is shown in Figure 4.6b, *Savannah River/Floodplain CSM* in Appendix B, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.1a, *RBES Planned End State By Watersheds (G-Area Only)* in Appendix B, provides a listing of the G Area hazards and facilities with associated characteristics. The major hazards in the SR Watershed that require remediation are located in A/M-Area, D-Area, and TNX. There are no G-Area "to go" units with the exception of the Savannah River / Floodplain / Swamp IOU.

Current Watershed Cleanup Status

Table 4.1a, *RBES Planned End State By Watersheds (G-Area Only)*, provides the current status for the G-Area hazards and the known remedial technology implemented for completed units. For hazards in the "to go" phase where the response action has not been

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selected, Hazard Type CSMs located in Appendix D provide the response actions likely to be implemented by media for each hazard type.

Table 4.2, *RBES Hazard Type Crosswalk for Watershed "To Go" Units (G-Area Only)* in Appendix B, depicts a crosswalk that categorizes each of the “to go” G-Area hazards and facilities in the SR Watershed to a hazard type CSM located in Appendix D. All remaining hazards will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies as depicted in the hazard type CSMs and Table 4.2.

Eight G Area waste units were identified in the SR Watershed of which seven are complete. The remaining waste unit is categorized as Hazard Type 11 (Integrator Operable Units). Hazard sources to be evaluated for the remaining waste unit include metals, organic and inorganic constituents, and radionuclides.

Planned Watershed End State

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for G-Area units within the SR Watershed is to accommodate a final risk level of 10^{-4} to 10^{-6} for the industrial worker

4.2 Hazard-Specific Discussion by Areas (all discussion is AREA pure---note when an Area impacts multiple WS-IOUs)

4.2.1 A Area

- **Area Description**

A-Area is located in the northwest part of SRS and is approximately 1,050 m (3,500 ft) from the plant boundary and covers approximately 400 acres (1.6 km^2). A-Area waste units are located in the Upper Three Runs and Savannah River/Floodplain Swamp Watersheds. Facilities and activities have a relatively low potential for offsite release of hazardous materials. The current designated land use for A-Area is administrative and industrial.

- **Mission Description**

A Area is primarily comprised of administrative, laboratory, industrial support, and some warehouse facilities. This part of the site functions as the primary entry point for visitors to the site. Most facilities were constructed in the early 1950s and many continue to provide adequate accommodations for their intended missions. However others presently require investment in maintenance and repair while still others are slated for deactivation and dcommissioning.

The Savannah River Technology Center (SRTC) is a major tenant in A Area. The facility occupies the primary laboratory building (773-A) and a number of support facilities. As part of research and development, it is likely that small quantities of the constituents used in site processes were used at SRTC at some time. Originally established to support the production of nuclear materials for national defense, SRTC plays a key role in advancing science and technology developments for defense applications. As a national center for technological innovations, SRTC facilities continue to support the national interest by providing the laboratory setting for technology advancements in waste vitrification, environmental remediation, robotics, and advanced sensor systems. SRTC laboratory buildings, constructed in 1953, have been effectively maintained throughout the history of SRTC. Modest infrastructure investments have been made recently to these buildings and have prepared them to support SRTC’s current and future missions. There are some signs of deterioration which will require future investment in major mechanical support equipment and instruments, such as heating, ventilation, and air conditioning (HVAC) systems and fume hoods. However, the SRTC infrastructure is in relatively good shape and is prepared to support the enduring nature of the SRTC. SRTC provides critical nuclear research and support to the tritium, plutonium, and legacy wastes missions. For this reason, heightened security is provided for this facility.

Another major A-Area tenant is the Savannah River Ecology Laboratory (SREL), operated by the University of Georgia. Since 1951, SREL has conducted independent ecological research at SRS, which includes research on land and water use, land and water management, and the impact of SRS operation practices on the environment. A permanent ecology laboratory was established in 1961, and new laboratories and a new computer center were added in the 1990s. In addition to the laboratory, SREL operates three greenhouses, an animal care facility, an aquatic animal care facility, an avian housing facility, a distance learning facility, a series of small ponds, and various storage and maintenance buildings.

A Area is also the location of several critical 24-hour operations, including the Emergency Operations Center, SRTC Laboratory Operations, Records Storage, SRS Fire Department, and the Central Unclassified and Classified Computer Facilities.

- **Area Hazards**

Figures 4.7a.1, *A Area (Lower) Map*, and 4.7a.2, *A Area (Upper) Map*, both in Appendix C, depict the waste units and facilities located in A-Area. The conceptual site models for A-Area are provided in Figures 4.7b.1, *A-Area CSM for Upper Three Runs*, and 4.7b.2, *A-Area CSM for the Savannah River/Floodplain Swamp Watershed*, both located in Appendix C. These depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas,* located in Appendix C, provides a listing of the A-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in A-Area that require further evaluation and potential remediation are the SRL 904-A Process Trench, A-001 Outfall, A-Area Miscellaneous Rubble Pile, and the Miscellaneous Chemical Basin.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas,* provides the current remedial status for the A-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units* in Appendix C, depicts a crosswalk that categorizes each of the "to go" units to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 14 of the 31 A-Area waste units is complete (Table 4.3a, *RBES Planned End State by Area*). For the remaining 17 "to go" waste units, seven units are categorized as Hazard Type 9 (Miscellaneous Sites), six as Hazard Type 5 (Nonradiological Rubble Piles and Pits), three as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), and one as Hazard Type 6 (Nonradiological Seepage Basins). Hazard sources to be evaluated for the remaining A-Area waste units include a variety of radioactive releases, nonradioactive rubble and building debris, organic and inorganic constituents.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for A-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

The primary focus for facility end state in A Area includes a significant shutdown of A Area activities to shrink the infrastructure maintenance and operation requirements and consolidate and strengthen secure areas. Additional studies and characterization are needed to determine the level of shutdown of A Area facilities before final decisions are made. These studies are needed once DOE decisions on future missions for SRS are made. Any additional consolidation of administrative areas would be located closer to the center of the site.

Essential infrastructure elements of SRTC technical area facilities will be maintained operable through 2025 to serve Environmental Management (EM) and National Nuclear Security Administration (NNSA) needs. The need by enduring DOE Programs for new, centralized facilities or a reduced footprint version of the current facilities would be assessed at that time. New missions are expected to provide any required, incremental research and development infrastructure. Any new SRTC facility would most likely be located in the central industrialized area of the site.

Site warehouse operations in A Area would not be necessary if the administrative and laboratory functions were relocated. Warehouse and maintenance operations in A Area could be consolidated in N Area. After the majority of employees have relocated to the center of the site, the steam requirements would be lessened, and use of the A Area Powerhouse could be phased out.

SREL facilities are newer than most of the buildings in A Area and still have some useful life. As long as it is cost effective to maintain infrastructure in A Area for SREL functions, SREL could remain in A

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Area. As the facilities in SREL near the end of their useful life, new administrative and laboratory facilities could be constructed near B Area outside the secure zone to allow public access. By 2026, according to the proposed reconfiguration scenario, no building in A Area would be in use, and all facilities would have been or about to begin transition to deactivation and decommissioning.

The SRS Cleanup Reform Vision is to demolish buildings and structures located in A Area by 2025. The only exceptions will preserve unique analytical capabilities of the Savannah River Technology Center (SRTC) and provide a significantly reduced SREL footprint composed of one or possibly two structures and no permanent workforce at SRS.

A Area contains numerous administrative, technical support, and storage facilities including the Savannah River Ecology Laboratory (SREL). SREL features buildings and structures that are newer than most buildings in A Area and may remain in operation outside EM sponsorship.

Below is a table showing the number of nuclear, radiological and industrial facilities in A Area. End states are shown as either demolished or in situ.

A Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	Dem	ISD
Nuc	8	325,544	0	8	0
Rad	0	0	0	0	0
Oth Ind	139	1,342,353	0	139	0
Total	147	1,667,897	0	147	0

Nuc- Nuclear
Rad – Radiological
Oth Ind – Other Industrial
No. – Number of facilities
Sq Ft – Square Feet
Comp – Complete
Dem – Demolished
ISD – In situ disposal

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan,* Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.2 B Area

- **Area Description**

B Area is located approximately four miles from A Area, near the intersection of Road C and Road 2. It is comprised primarily of administrative, protective force operations, laboratory, and warehouse facilities. All B-Area waste units are located in the Upper Three Runs Watershed with the exception of one rubble pile located in the Savannah River/Floodplain Swamp Watershed.

Some B-Area facilities were constructed in the early 1950s and new administrative buildings were added in the 1990s. Modern administrative, laboratory and engineering facilities were recently constructed for information technology, environmental sciences, safety and health, project engineering and construction, and procurement personnel. The current land use designation for B-Area is site industrial.

- **Mission Description**

A major tenant in B Area is Wackenhut Services, Incorporated – Savannah River Site (WSI-SRS), which provides protective-force personnel to guard DOE security interests. SRS protective force capabilities include site access control at perimeter barricades, law enforcement, investigations, special response teams, helicopter operations, boat patrols, sophisticated alarm centers, live fire ranges, and canine operations. Other WSI-SRS facilities located in B Area include the Aviation Operations Facility, the Special Response Team Facility, the Canine Facility, Multi-Media Lab, General Repair, Training Exercise Facility, and the Ammunition Storage Facility. SREL currently operates laboratories in B Area, adjacent to WSI-SRS.

Bordering B Area, in an area formerly called U Area, is the location of the former Heavy Water Components Test Reactor (HWCTR). The facility was a research and development reactor built in the 1960s and operated for only a few years. It was shut down permanently in 1967. The support buildings and structures have been demolished, and the only structure remaining is the reactor building. This building is a high-integrity steel containment structure that has been deactivated and welded shut, placing the facility into long-term safe storage.

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- **Area Hazards**

Figure 4.8a, *B-Area Map* in Appendix C, depicts the waste units and facilities located in B Area. Because B Area is positioned on a topographic and hydrogeologic divide, two conceptual site models are provided in Figures 4.8b.1, *B-Area CSM for Upper Three Runs Watershed* in Appendix C, and Figure 4.8b.2, *B-Area CSM for Savannah River/Floodplain Swamp Watershed*, depicting the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3, *RBES Planned End State by Area* in Appendix C, provides a listing of the B-Area waste units with associated characteristics. G-Area waste units were discussed previously with the appropriate watershed. There are no major hazards in B Area that require remediation.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Area*, provides the current remedial status for the B-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 14 of the 17 B-Area waste units is complete (see Table 4.3). For the remaining three "to go" waste units, two units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits) and one unit as Hazard Type 9 (Miscellaneous Sites). Hazard sources to be evaluated for the remaining B-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for B-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

- **Mission and Facility End State**

Plans are for B Area to become a centralized site administrative complex. The Department of Energy – Savannah River (DOE-SR) and WSRC administrative functions currently located in A Area will be relocated to B Area over the next 10 years, as new office space is made available to consolidate site administrative employees. A facility or facilities to accommodate site visitors and provide badging will also be constructed in B Area. This facility will be located outside of the secure area, and a security gatehouse will be located near to the B-Area functions to control public access to the site operations.

A new training facility may be constructed in B Area to move this administrative function out of the Heavy Industrial Zone. Locating the training function outside of the nuclear industrial area and closer to site boundaries would facilitate evacuation in the event of an emergency incident. This would also be a cost savings as a B-Area location would put the majority of site employees closer to the training facility. Support operations, such as fire protection and record storage, also will need to be constructed.

As the U. S. Forest Service (USFS-SR) and SREL facilities near the end of their useful life, USFS-SR administrative and educational program functions and SREL administrative offices will be located in B Area. The Forest Service will also maintain strategically placed fire protection equipment, engineering, and maintenance materials and equipment in B Area and elsewhere around the site. SREL administration will be located outside the secure area near the visitor's center and SREL will maintain laboratory and environmental monitoring facilities around the site, as needed.

In the absence of continuing mission area assignments, all facilities in B Area will be demolished by 2025.

Contiguous to B Area, in an area formerly called U Area, is the location of the former Heavy Water Components Test Reactor (HWCTR). This facility contained a research reactor built in the 1960s and operated for only a few years. HWCTR was shut down permanently in 1967. The support buildings and structures have been demolished, and the only structure remaining is the reactor building, a high-integrity steel containment structure that has been

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deactivated and welded shut, placing the facility into in-situ disposal as its end state.

Below is a table showing the number of nuclear, radiological and industrial facilities in B Area. End states are shown as either demolished or in situ.

B and U Areas Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	31	618,343	0	30	1
Total	31	618,343	0	30	1

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.3 C Area

- **Area Description**

C Area is comprised of nuclear industrial, light machining and administrative facilities. All C-Area waste units are located in the Fourmile Branch Watershed. The current land use for C Area is site industrial.

- **Mission Description**

C Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The C-Area Reactor at SRS is inactive, and the reactor building is being used for alternative purposes until disposition. Most facilities were originally constructed in the early 1950s and continue to provide adequate accommodations for their current missions.

C Reactor is a multiple-story facility that contained a heavy water moderated production reactor. The C Reactor Assembly Area, formerly used for the receipt, handling, and storage of new, unirradiated fuel and targets from the M-Area manufacturing area, currently houses the Site Decontamination Center. The disassembly area consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains several million gallons of water and in the past it allowed the target and fuel assemblies to undergo natural radioactive decay after neutron irradiation, usually over a period of 12 to 18 months. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-C Disassembly Basin or Assembly Area. The ground level of C Reactor has been modified to serve as a central decontamination facility for radiologically contaminated operations and maintenance equipment. However, heavy water continues to be stored in the reactor building in the designated process tanks.

- **Area Hazards**

- Figure 4.9a, *C Area Map* in Appendix C, depicts the waste units and facilities located in C Area. The conceptual site model for C Area is provided in Figure 4.9b, *C-Area CSM for Fourmile Branch Watershed* in Appendix C, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the C-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in C Area that require further evaluation and potential remediation are the C-Area Disassembly Basin, C-Area Reactor Discharge Canal, Inactive Process Sewer Lines, C Reactor Area Cask Car Railroad Tracks, and C-Area Reactor Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, also provides the current remedial status for the C-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 20 of the 31 C-Area waste units is complete (see Table 4.3). For the remaining 11 "to go" waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 4 (Inactive Process Sewer Lines), four units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining C-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D. C-Area Groundwater is the only C-Area groundwater waste unit in the "to go" phase. Figures 4.2a, *Fourmile Branch Map*, and 4.9a, *C-Area Map*, shows the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figure 4.9b, *C-Area CSM for Fourmile Branch Watershed*. A tritium plume, a TCE plume and a PCE plume were identified in C Area. Sources of the contamination have been identified within the C Reactor area perimeter fence. Tritium is related to the operation of the reactor itself and was released from numerous sources and spills. Characterization data indicates the tritium source is depleted. A TCE source was discovered near the assembly building and appears to be the source of the reactor TCE plume. The TCE source is considered to be a continuing source because of the residuals in the soil. In addition, tritium has been detected above MCLs in Fourmile Branch and its tributaries Caster Creek and Twin Lakes.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for C-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

By 2025, all hardened reactor facilities will be deactivated. All non-hardened support buildings and administrative buildings will have been demolished. All temporary buildings and trailers would have been removed. The Decontamination Center within 105-C would no longer exist. The Disassembly Basin would have been decommissioned with an environmental cap installed. A fence around the perimeter of the remaining facilities will secure the 105-C complex.

Below is a table showing the number of nuclear, radiological and industrial facilities in C Area. End states are shown as either demolished or in situ.

C Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	1	385,010	0	0	1
Rad	0	0	0	0	0
Oth Ind	24	389,915	0	17	7
Total	25	774,925	0	17	8

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.4 D Area

- **Area Description**

D Area is located 1.4 km (0.9 mi) east of the Savannah River on an upland terrace between Upper Three Runs to the north and Fourmile Branch to the south. The site is at an elevation of 42.7 m (140 ft) above msl. D-Area waste units are located in the Savannah River/Floodplain Swamp Watershed. The current land use for D Area is site industrial.

- **Mission Description**

D-Area Heavy Water Facilities provided the heavy water necessary to moderate SRS's five nuclear reactors. D Area originally contained three sets of heavy water extraction towers with the support facilities needed to concentrate sufficient heavy water using the Savannah River as the water source. These original towers were operational until 1982. Since then, all three sets of extraction towers have been demolished with only the foundations remaining. The remaining heavy water rework facilities were

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shutdown in 1998 and deactivated the following year. Facilities currently operating in D Area include a coal-fired power plant (leased by SRS to the South Carolina Electric and Gas Company [SCE&G]). Some non-power plant administrative and support facilities are being used in the short term but will soon become inactive (under surveillance and maintenance)and are scheduled for deactivation and decommissioning.

- **Area Hazards**

Figure 4.10a, *D-Area Map* in Appendix C, depicts the waste units and facilities located in D-Area. The conceptual site model for D Area is provided in Figure 4.10b, *D Area CSM for Savannah River/Floodplain Swamp Watershed* in Appendix C and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas* in Appendix C provides a listing of the D-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in D-Area that require further evaluation and potential remediation are the 488-1D, 488-2D, and 488-4D Ash Basins and the D Area Groundwater Operable Unit.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the D-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 15 of the 26 D-Area waste units is complete (Table 4.3). For the remaining 11 "to go" waste units, five units are categorized as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), three units as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining D-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D. D-Area Groundwater Operable Unit is the only D-Area groundwater waste unit in the "to go" phase. Figures 4.6a, *Savannah River/Floodplain Map Watershed*, and 4.10a, *D Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figure 4.10b, *D-Area CSM for Savannah River/Floodplain Swamp Watershed*. Low concentration and commingled tritium, TCE and inorganic plumes were identified in D Area. The TCE and tritium sources are thought to be depleted in the vadose zone. The inorganic plume sources have been identified and are, or will be, addressed. D-Area groundwater with contaminants above MCLs has the potential to impact the Savannah River Swamp and Savannah River. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for D-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

The extraction towers have been demolished and every building and structure is scheduled for demolition including the coal-fired generating station.

Below is a table showing the number of nuclear, radiological and industrial facilities in D Area. End states are shown as either demolished or in situ.

D Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	0	0	0	0	0
Rad	2	14,867	0	2	0
Oth Ind	42	219,417	0	41	1
Total	44	234,284	0	43	1

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.5 E Area

- **Area Description**

E Area is located in the central part of SRS between the F and H-Area Separations Areas and is approximately 9.7 km (6 mi) from the plant boundary and covers approximately 330 acres. All E-Area waste units are located in the Fourmile Branch Watershed. The current land use for E Area is site industrial.

- **Mission Description**

E Area, which includes the Old Burial Ground, Mixed Waste Management Facility, TRU waste pads, and E-Area Vaults, receives low-level solid, TRU, and mixed waste from all site areas (see Figure 4.11a*, E Area Map*). E Area facilities are maintained to manage previously received waste and to prepare for the receipt of waste from new site operations. Low-level waste is disposed in the E-Area Vaults or trenches. Transuranic (TRU) waste is characterized and made ready for shipment to the Waste Isolation Pilot Plant (WIPP) for ultimate disposal. The total inventory of TRU waste in storage is currently over 10,000 cubic meters. This waste, some of which has been in storage since 1974, is contained in numerous packaging configurations including 55- and 83-gallon drums, concrete culverts and casks and large steel boxes. This waste contains ~680,000 curies. The primary isotopes are plutonium-239 and plutonium-238. The waste is physically stored on 22 concrete pads. Ten of these pads are enclosed and contain 55- and 83-gallon waste drums. Boxes, culverts and casks are stored on non-enclosed pads. Mixed waste is stored and will be sorted and segregated to allow waste to be readied for shipment to offsite treatment facilities.

The site recently began operations in support of the shipment of waste to WIPP. Initial operations are focused on relatively low activity 55-gallon drums of TRU waste. Facilities in operation include characterization/certification facilities (assay, x-ray, headspace gas analysis), both fixed and provided by mobile vendors, Visual Examination (VE) facilities and TRUPACT-II loading facilities, both fixed and mobile. Additional capabilities are also planned to prepare the highest of activity waste drums and all other containers including culverts, casks and steel boxes for disposal to WIPP.

- **Area Hazards**

Figure 4.11a, *E-Area Map* in Appendix C, depicts the waste units and facilities located in E-Area. The conceptual site model for E Area is provided in Figure 4.11b, *E-Area CSM Fourmile Branch Watershed* in Appendix C, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3, *RBES Planned End State by Areas*, provides a listing of the E-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in E Area that require further evaluation and potential remediation are the Old Radioactive Waste Disposal Facility (including Solvent Tanks), Low-Level Radioactive Waste Disposal Facility, and the Mixed Waste Management Facility (Groundwater).

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the E-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type

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CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for four of the seven E-Area waste units is complete (see Table 4.3a, *RBES Planned End State by Areas*). For the remaining three "to go" waste units, two units are categorized as Hazard Type 1 (Burial Ground Complex) and one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins). Hazard sources to be evaluated for the remaining E-Area waste units include a variety of radioactive burials, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D. The Mixed Waste Management Facility is the only E-Area groundwater waste unit in the "to go" phase. Figures 4.2a, *Fourmile Branch Map Watershed*, and 4.11a, *E-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figure 4.11b, *E-Area CSM for Four Mile Branch Watershed*. Groundwater monitoring indicates several plumes emanating from the Burial Ground Complex. Including the Northwest, Northeast, Southwest, and Southeast Plumes. Groundwater contaminants identified in the Burial Ground Complex Groundwater include 1,1-dichlorethylene, carbon tetrachloride, PCE, TCE, radium, tritium, and uranium-238. Contaminated groundwater outcrops along seep locations in Fourmile Branch.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for E-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

All legacy TRU waste currently in storage will have been processed and shipped to WIPP for disposal or disposed of in alternative disposal facilities by the end of 2006. Facility operations would continue on a limited basis to process any newly generated waste not certifiable for direct shipment. However, because EM will not need any SRS facilities after 2025, they will be deactivated and decommissioned, primarily by in-situ disposal except for the Solid Waste Disposal Facility in E Area. A final remedy for a large portion of E Area containing the 200-acre Old Radioactive Waste Burial Ground – the highest risk posed by the 515 cleanup projects in the SRS Environmental Restoration Program – will be finished in 2008. It is likely low-level radioactive waste generated by SRS tenants or the Naval Nuclear Propulsion Program will continue to be buried within the Solid Waste Disposal Facility after 2025, but the volume will be extremely small. Sanitary, hazardous, low-level, and radioactive mixed waste will be shipped directly to a commercial vendor for treatment and disposal. TRU will be shipped to New Mexico for geologic disposal. A perimeter fence will secure the remaining E-Area facilities.

Below is a table showing the number of nuclear, radiological and industrial facilities in E Area. End states are shown as either demolished or in situ.

E Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	16	255,299	0	13	3
Rad	0	0	0	0	0
Oth Ind	7	24,040	0	6	1
Total	23	279,339	0	19	4

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.6 F Area

- **Area Description**

F Area is primarily comprised of heavy nuclear industrial, warehouse, and administrative facilities. F-Area waste units are located in the Fourmile Branch and Upper Three Runs Watersheds. The current land use for F Area is site industrial.

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- **Mission Description**

F Area facilities include the F-Canyon Building, Depleted Uranium (DU) Processing Facility, FB-Line Facility, Metallurgical Facilities, Naval Fuels Building, Central Analytical Laboratory, the Mock-up/Fabrication Facility, medical facilities, and the F-Area Tank Farm. F Area is one of the two areas located near the center of SRS where nuclear chemical separations and waste management operations are performed. The primary function of these facilities is to stabilize special nuclear material (SNM) from spent fuels, irradiated targets, and other legacy nuclear materials and to evaporate and store the liquid high-level waste generated by these operations.

Chemical separation and purification of these materials is accomplished in facilities known as canyons. The canyons are supported by ancillary facilities that provide further chemical conversion, cold chemical feeds, or general facility services. F-Area Canyon and H-Area Canyon are the only two nuclear chemical processing and separations facilities in the DOE Complex. In 2003 DOE began to phase out the F-Area Canyon with deactivation expected to be completed by 2006. The remaining reprocessing needs will be met by the H-Area Canyon. .

High-level liquid waste evaporation and storage is accomplished in the F-Tank Farm (FTF). The purpose of FTF is to safely store and manage an inventory of approximately 15 million gallons (127 million curies) of liquid high-level radioactive waste in 20 underground storage tanks. This waste has accumulated from nuclear material production operations at the Savannah River Site.

These interim storage tanks were built underground to provide shielding from the intense radiation fields of the highly radioactive waste. Originally there were 22 of these waste storage tanks, but two have been emptied and operationally closed. The waste tanks range in volume between 750,000 gal and 1,300,000 gal (each with systems for leak detection, liquid level monitoring, ventilation, combustible gas monitoring, temperature monitoring and cooling, and remote inspection).

In addition to the tanks, FTF also contains two evaporator systems, two control rooms, cooling water systems, waste transfer systems, and other support structures (offices, maintenance shops, equipment/material storage, etc.). The 2F Evaporator is currently operating. However, the 1F Evaporator has a failed tube bundle and is not operable.

The former Naval Fuels facility in F Area has been deactivated and is safely maintained in a low-cost surveillance and maintenance mode. D&D activities are proceeding to remove this facility. .

- **Area Hazards**

Figure 4.12a, *F-Area Map* in Appendix C, depicts the waste units and facilities located in F-Area. Because F Area is positioned on a topographic and hydrogeologic divide, two conceptual site models for F Area are provided in Figures 4.12b.1, *F-Area CSM for Fourmile Branch Watershed* and 4.12b.2, *F-Area CSM for Upper Three Runs Watershed*, which depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by* Areas, provides a listing of the F-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in F-Area that require further evaluation and potential remediation are the Combined Spills from 242-F, 643-G and 701-1F, F-Area Retention Basin, F-Area Tank Farm, and the F-Area Inactive Process Sewer Lines. In addition, the F&H-Area Hazardous Waste Management Facilities (HWMF) and the General Separations Western Groundwater Operable Unit are the two groundwater units in F-Area with major hazards.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the F-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 35 of the 64 F-Area waste units is complete (Table 4.3). For the remaining 29 “to go” waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units

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as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), 21 units as Hazard Type 9 (Miscellaneous Sites) and two units as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining F-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D. Figures 4.1a, *Upper Three Runs Map*, and 4.2a, *Fourmile Branch Map*, and 4.12a, *F-Area Map*, shows the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.12b.1, *F-Area CSM for Fourmile Branch Watershed*, and 4.12b.2, *F-Area CSM for Upper Three Runs Watershed*. The F&H-Area HWMF and the General Separations Western Groundwater Operable Unit are the two remaining groundwater units in F-Area. Groundwater underlying the F-Area HWMF has been impacted by F-Area operations. Metals, nitrate, organics, tritium and other radionuclides are present above MCLs in the groundwater beneath the F-Area seepage basins. Sampling at seep locations indicates that contaminated groundwater continues to impact the Fourmile Branch IOU.

The General Separations Area (GSA) Western Groundwater Operable Unit (OU) encompasses approximately 1100 acres in the north west portion of the General Separations areas and includes the previous F-Area Canyon Groundwater OU and the F-Area Tank Farm Groundwater OU. The boundaries of the Western Groundwater OU include the Upper Three Runs to the west and north; an unnamed tributary to Upper Three Runs Creek, the MWMF, and the Old Radioactive Waste Burial Ground to the east. Metals, VOCs, and radionuclides are present in the groundwater at levels that exceed MCLs. The plumes are migrating towards the Upper Three Runs Creek and may impact the Upper Three Runs IOU.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for F-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

F Canyon, FB Line, and ancillary facilities will be decommissioned by in-situ disposal . The 235-F facility will remain operable through 2020 in support of the plutonium storage mission. At that time, the 235-F facility will be deactivated and decommissioned by in situ disposal and any remaining administrative facilities in F Area would be demolished or made available for reuse by another DOE or federal program.

All HLW Tanks in FTF will have been closed (removed from service and filled with grout). In addition, the 1F and 2F Evaporators and contaminated waste transfer systems would have been closed by isolating utilities and filling with grout. All above-ground buildings or structures will be demolished, and a perimeter fence will secure the remaining F Area facilities.

Below is a table showing the number of nuclear, radiological and industrial facilities in F Area. End states are shown as either demolished or in situ.

F Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	36	698,359	0	29	7
Rad	10	200,924	0	8	2
Oth Ind	93	382,010	0	91	2
HLW Tanks	22	N/A	2	0	22
Total	161	1,281,293	2	128	33

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.7 G Area

- **Mission Description**

G Area is the area outside of site process areas, encompassing over 95 percent of the site. This area includes USFS-SR facilities, a rail network, Research

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Set-Aside Areas supporting the National Environmental Research Park (NERP), habitat and forest management areas, environmental monitoring activities, and facilities to support subcontractors. The developed portions of G Area primarily are comprised of light industrial, warehouse, and administrative facilities.

Information on area hazards, cleanup status, and planned end states can be found in the Watershed discussions in Section 4.1.

- **Mission and Facility End State**

There are no new major facilities planned for G Area. Under the proposed reconfiguration, by 2020, the USFS-SR administrative and educational program functions could be located to new facilities in B Area. In addition to the facilities in B Area, the Forest Service would also maintain strategically placed fire protection equipment and maintenance materials and equipment elsewhere around the Site. The USFS-SR buildings currently located in G Area would be removed.

G Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	102	249,480	0	88	14
Total	102	249,480	0	88	14

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.8 H Area

- **Area Description**

H Area is primarily comprised of heavy nuclear industrial, warehouse, and administrative facilities. H-Area waste units are located in the Fourmile Branch and Upper Three Runs Watersheds. The current land use for H-Area is site industrial.

- **Mission Description**

H Area is the second of the two nuclear chemical separation areas at SRS. H-Area facilities (H Canyon and HB Line) are used to stabilize nuclear materials. H Outside Facilities, which is adjacent to H Canyon/HB Line, supports separation processes by providing bulk chemical storage, liquid waste disposal, and nuclear material storage.

DOE plans to phase out its reprocessing capabilities and use of the canyons but must balance this closure with the need to stabilize fissile materials. Implementation of the 1992 decision by the Secretary of Energy to phase out canyon operations at SRS is proceeding with the use of the canyons limited to stabilizing certain deteriorating SNF, plutonium compounds, and other nuclear materials to forms suitable for safe and secure, long-term storage or disposition. After the H-Area Canyon/HB-Line processing commitments are completed, they will be deactivated.

The current missions of the H-Area Canyon include dissolution of Mark-16/22 and other SNF, dissolution of plutonium and enriched uranium residues, conversion of plutonium-239 and neptunium-237 to oxide, and blenddown of highly-enriched uranium solution to allow a low enrichment uranium solution of five percent enrichment to support the Tennessee Valley Authority (TVA) program for commercial power reactor fuel.

H Area also houses the Receiving Basin for Offsite Fuels (RBOF), which is being deinventoried.

High-level liquid radioactive waste is stored, evaporated, and pretreated for vitrification in H Area. The HLW facilities consist of the portion of this area know as H-Tank Farm (HTF). The purpose of the HTF Facility is to safely store and manage an inventory of approximately 23 million gallons (273 million curies) of liquid high-level radioactive waste in 29 underground storage tanks and to pre-treat the sludge portion of this waste to enable final processing at the Defense Waste Processing Facility (DWPF). This waste has accumulated from nuclear material production operations at SRS. These interim storage tanks were built underground to provide shielding from the intense radiation fields of the highly radioactive waste. All 23 of these tanks are currently in use. The waste tanks range in volume between 750,000 gal and 1,300,000 gal (each with systems for leak detection, liquid level monitoring, ventilation, combustible gas monitoring, temperature monitoring and cooling, and remote inspection).

In addition to the tanks, HTF also contains three evaporator systems, three control rooms, waste pre-treatment buildings, cooling water systems, waste transfer systems, and other support structures (offices, maintenance shops, equipment/material storage, etc.). The 2H and 3H Evaporators are currently operating. However, the 1H Evaporator has a failed tube bundle and is not operable.

The Consolidated Incineration Facility (CIF), also located in H Area, was designed and constructed to thermally treat and reduce the volume of low-level hazardous and mixed wastes. The CIF is currently shutdown and is maintained under a minimum surveillance and maintenance regimen.

The Effluent Treatment Facility (ETF) collects and treats low-level radioactively and chemically contaminated wastewater from the HLW Program and the Nuclear Materials Management Program by removing chemical and radioactive contaminants before discharging the water.

Activities for the Defense Program, tritium loading and finishing, also occur in H Area. The Tritium Facilities consists of four main buildings. Three of these, buildings 232-H, 234-H, and 238-H, have operated for many years. These buildings are the second generation tritium structures built onsite, and they house a number of key operations, including reclamation of previously used tritium reservoirs; receipt, packaging and shipping of reservoirs; recycling and enrichment of tritium gas; and several key laboratory and maintenance shop areas.

In 1994, tritium operations began in the newest structure, 233-H, which was referred to as the Replacement Tritium Facility during construction. Operations conducted in this building include unloading gases from reservoirs returned from the Department of Defense, separating and purifying the useful hydrogen isotopes (tritium and deuterium), mixing the gases to exact specifications, loading the reservoirs, and performing various reservoir performance tests (e.g., function testing, environmental conditioning).

The Tritium Facility Modernization and Consolidation Project is relocating several existing process systems and equipment, as well as laboratory functions, from Building 232-H to Buildings 233-H and 234-7H. Processes that handle tritium or tritium containing gases will be relocated to Building 233-H. Sufficient processing capability and capacity will be included to support the Tritium Extraction Facility, Building 264-H. Other processes or laboratory facilities, including the environmental storage and metallurgical operations, will be relocated to Building 234-7H, a 7,000 square-foot building added at the north end of Building 234-H. Start-up testing is underway and scheduled for completion in FY 2004.

The Tritium Extraction Facility (TEF), which has been designed for a 40-year operating life, will provide the capability to receive Tritium-Producing Burnable Absorber Rods from the Tennessee Valley Authority reactor at Watts Barr, Tennessee, and extract tritium-containing gases. The TEF is being located adjacent to Building 233-H to allow common facilities to be shared.

Other H-Area facilities include medical, warehouse, and training facilities. H-Area warehouse facilities provide material coordination, acquisition, and processing for numerous SRS operations; and their conditions vary from poor to good.

- **Area Hazards**

Figure 4.13a, *H-Area Map* in Appendix C, depicts the waste units and facilities located in H-Area. Because H Area is positioned on a topographic and hydrogeologic divide, two conceptual site models for H-Area are provided in Figures 4.13b.1, *H-Area CSM for Fourmile Branch Watershed*, and 4.13b.2, *H-Area CSM for Upper Three Runs Watershed*, which depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the H-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in H-Area that require further evaluation and potential remediation are the H-Area Retention Basins, H-Area Process Sewer Lines, H-Area Inactive Process Sewer Lines, Warner's Pond, H-Area Retention Basin, HP-52 Ponds, and the General Separations Area Eastern Groundwater Operable Unit.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the H-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 19 of the 54 H-Area waste units is complete (Table 4.3). For the remaining 35 "to go" waste units, seven units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), 23 units as Hazard Type 9 (Miscellaneous Sites) and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining H-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D. Figures 4.1a, *Upper Three Runs Map*, and 4.2a, *Fourmile Branch Map*, and 4.13a, *H-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.13b.1, *H-Area CSM for Fourmile Branch Watershed,* and 4.13b.2, *H-Area CSM for Upper Three Runs Watershed*. The General Separations Area (GSA) Eastern Groundwater OU is the only groundwater unit in H-Area that has not completed remediation. The GSA Eastern Groundwater OU includes the previous groundwater systems associated with the H-Area Tank Farm Groundwater OU and other operating facilities and waste units. Metals, VOCs, and radionuclides are present in the Eastern Groundwater OU at levels that exceed MCLs. However, these exceedances are sporadic and localized and no definable plumes appear to emanate from a single operating facility or waste unit.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for H-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

H Canyon, HB Line, the Receiving Basin for Offsite Fuels, and ancillary facilities will be deactivated before in-situ disposal. In-situ disposal of the HLW tanks means that empty tanks will be removed from service and filled with grout. In addition, the 1H, 2H, and 3H Evaporators and contaminated waste transfer systems will be decommissioned by isolating the equipment from all utilities before the evaporators are stabilized structurally with grout. All above-ground buildings including the Consolidated Incinerator Facility and Effluent Treatment Facility will be demolished. A perimeter fence will secure the remaining H Area facilities.

NNSA will decide whether tritium processing operations will continue at SRS after 2025.

Below is a table showing the number of nuclear, radiological and industrial facilities in H Area. End states are shown as either demolished or in situ.

H Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	52	461,958	0	37	15
Rad	20	263,835	0	16	4
Oth Ind	93	431,672	0	87	6
HLW Tanks	29	N/A	0	0	29
Total	194	1,157,465	0	140	54

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.9 K Area

- **Area Description**

K Area is a 1,440 hectare (3,558 acre) area located northeast of the geographical center of SRS and northwest of the nearest site boundary. All K-Area waste units are located in the Pen Branch Watershed. The current land use for K Area is site industrial.

- **Mission Description**

K Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. K Reactor is similar in size and layout to the other reactor areas. The K-Area production reactor is in shutdown condition with no capability of restart. The K-Area Disassembly Basin has been deinventoried and deactivated. K Area also serves to temporarily receive and store plutonium, highly-enriched uranium fuel, and large amounts of tritiated heavy water consolidated from other facilities. K Area is primarily comprised of heavy nuclear industrial, administrative, safeguards and security, and some warehouse facilities.

Current K-Area activities include all programmatic and physical support efforts related to safe storage of Special Nuclear Materials (SNM) already referenced and from 235-F and FB-Line and offsite sources. K Area is being used temporarily to store plutonium, Highly Enriched Uranium, and large volume of heavy water that has been contaminated by tritium.

Facility modifications have been completed to allow receipt and storage of plutonium in the 105-K Building. The modifications facilitate the early deinventory and shutdown of the Rocky Flats Environmental Technology Site (RFETS) to avoid an estimated $1.3 billion in operating costs. The storage and receipts from Rocky Flats will occupy a large area including the building's reconfigured reactor room and several adjacent areas. These areas include the Crane Wash Area, Crane Maintenance Area, and Stack Area. All plutonium will be stored in the containers in which they are received. No containers will be opened in the 105-K Building. Instead, containers that must be opened will be shipped to F Area/FB-Line through 2006 and the planned 3013 surveillance facility planned for 235-F thereafter. The K-Area Material Storage facility is currently designed to store up to 5,000 containers. This material will be dispositioned by 2020. Presently, ten K-Area facilities have been declared inactive.

- **Area Hazards**

Figure 4.14a, *K-Area Map* in Appendix C, depicts the waste units and facilities located in K-Area. The conceptual site model for K-Area is provided in Figure 4.14b, *K-Area CSM for Pen Branch Watershed* in Appendix C and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas* in Appendix C, provides a listing of the K-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in K Area that require further evaluation and potential remediation are the K-Area Disassembly Basin, K-Area Reactor Discharge Canal, K-Reactor Area Cask Car Railroad Tracks, and K-Area Reactor Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the K-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 18 of the 26 K-Area waste units is complete (Table 4.3). For the remaining eight "to go" waste units, three units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 7 (Sludge Application Sites), one unit as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining K-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

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Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. K-Area groundwater is the only K-Area groundwater waste unit in the "to go" phase. Figures 4.3a, *Pen Branch Map*, and 4.14a , *K-Area Map*, shows the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figure 4.14b, *K-Area CSM for Pen Branch Watershed*. Tritium and organics plumes have been identified to date, but groundwater characterization has not been completed, and a complete list of contaminants has not been completed. The K-Area Tritium Anomaly (previously Waste Unit 90) was combined with K-Area Groundwater. The anomaly was identified during quarterly groundwater sampling in 1990 by significant increases in tritium in seepage basin wells. Based on modeling predictions, groundwater from K-Area flows to Indian Grave Branch and Pen Branch where it discharges to the streams. There is the potential that contaminated groundwater impacts the Pen Branch IOU.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for K-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

Following plutonium deinventory (approximately 2020), the 105-K Building and associated facilities would begin deactivation unless turned over to another Lead Program Secretarial Office for further use. However, prior to this time, there will be some K Area facilities, not associated with the SNM Program, which will have been decommissioned.

All surplus fissile material and tritiated heavy water will be dispositioned. By 2025 all hardened reactor facilities will be decommissioned by in-situ disposal and all non-hardened buildings and structures in K Area will be demolished. A perimeter fence will secure the remaining K Area facilities.

Below is a table showing the number of nuclear, radiological and industrial facilities in K Area. End states are shown as either demolished or in situ.

K Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	2	388,326	0	1	1
Rad	0	0	0	0	0
Oth Ind	32	447,398	0	23	9
Total	34	835,724	0	24	10

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.10 L Area

- **Area Description**

L Area is an upland site region between Steel Creek and Pen Branch located approximately 3.1 km (1.9 mi) southwest of the geographical center of SRS and about 9.7 km (6 mi) northwest of the nearest site boundary. L-Area waste units are located in both the Steel Creek and the Pen Branch Watersheds. The current land use for L Area is site industrial.

- **Mission Description**

L Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The area is similar in size and layout to the other reactor areas. The L-Area production reactor is in shutdown condition with no capability of restart. However, the L-Area Disassembly Basin currently plays a crucial role in DOE's Spent Nuclear Fuel (SNF) mission.

Irradiated fuel assemblies have been stored in the disassembly basins since discharge from the reactors. Additional SNF is being, and will be, received and stored at SRS from offsite domestic and foreign research reactors, with offsite SNF receipts projected through the year 2019. L Area also provided space for consolidation of the D-Area Heavy Water. L Area is primarily comprised of heavy nuclear industrial, administrative, safeguards and security, and some warehouse facilities.

Current L-Area activities include programmatic and physical support related to receipt and safe storage of SNF, shipments of irradiated fuel to the canyons to complete the basin deinventory, future stabilization of SNF, and heavy water storage. SNF activities help manage the wet basin storage of SNF inventories to allow receipt of projected shipments and provide safe storage until a new treatment and dry storage facility is available.

Presently, eight L-Area facilities have been declared inactive.

- **Area Hazards**

Figure 4.15a, *L-Area Map*, depicts the waste units and facilities located in L-Area. Because the L-Area is positioned on a topographic and hydrogeologic divide, two conceptual site models for L-Area are provided in Figures 4.15b.1, *L-Area CSM for Pen Branch Watershed,* and 4.15b.2, *L-Area CSM for Steel Creek Watershed*, depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas,* provides a listing of the L-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in L Area that require further evaluation and potential remediation are the L-Reactor Area Cask Car Railroad Tracks, L-Area Hot Shop, and L-Area Southern Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the L-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 17 of the 28 L-Area waste units is complete (Table 4.3). For the remaining 11 “to go” waste units, two units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), four units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), two units as Hazard Type 9 (Miscellaneous Sites), and two units as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining L-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. L-Area Southern Groundwater and L-Area Northern Groundwater are the L-Area groundwater waste units in the “to go” phase. Figures 4.3a, *Pen Branch Map* and 4.4a, *Steel Creek Map*, and 4.15a, *L-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.15b.1, *L-Area CSM for Pen Branch Watershed*, and 4.15b.2, *L-Area CSM for Steel Creek Watershed.*

The L-Area Southern Groundwater OU encompasses all the groundwater south of L Reactor to L Lake. The L-Area Northern Groundwater has yet to be investigated. The L-Area Southern Groundwater OU investigation has identified groundwater contaminated with TCE, PCE, and tritium. Two distinct commingled plumes of tritium, TCE, and PCE exist south of the reactor and extend toward L Lake. Characterization data indicate that areas within the reactor perimeter fence are contributing sources to the plumes. A separate tritium plume exists to the west of the reactor area and is moving in a westward direction between Pen Branch and L Lake. Initial characterization and modeling indicate that the source of this plume is a retention basin located west of the reactor facility. Steel Creek is a gaining stream above L Lake and may be impacted by contaminated groundwater. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes and results will be evaluated with regards to IOU impact in the next periodic report.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end

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state for L-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

If EM is the programmatic owner of the L-Area facilities; the plan is to complete deinventory by the end of 2020 and deactivation by the end of 2022. By 2025 all hardened reactor facilities will be decommissioned by in-situ disposal and all non-hardened buildings and structures in L Area will be demolished. A perimeter fence will secure the remaining L Area facilities. Revised schedules and plans would be formulated if the facilities are turned over to a non-EM government entity, and the facility scope and lifecycle baseline plan changes.

Below is a table showing the number of nuclear, radiological and industrial facilities in L Area. End states are shown as either demolished or in situ.

L Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	1	385,010	0	0	1
Rad	1	4,087	0	1	0
Oth Ind	28	272,866	0	22	6
Total	30	661,963	0	23	7

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan,* Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.11 M Area

- **Area Description**

M Area is located in the northwest part of SRS and is approximately 1.6 km (1.0 mi) from the plant boundary and covers approximately 50 acres (0.2 km^2). D&D operations are currently being undertaken in M Area. M- Area waste units are located in the Upper Three Runs and Savannah River/Floodplain Swamp Watersheds. The current land use designation for M Area is site industrial.

- **Mission Description**

M Area formerly manufactured nuclear fuel and target elements for use in the production reactors. M Area housed materials fabrication facilities to support reactor operations, similar to structures found in non-nuclear metal and finishing operations, and produced special fuel assemblies containing targets for the production of special nuclear materials. The area is composed of three large fuel and target facilities, two laboratories, a wastewater treatment facility, a low-level waste vitrification facility, and numerous support facilities. Residual contamination exists in most of these facilities, a legacy of past operations. Both laboratories have been deactivated as well as several other facilities. Deactivation of the wastewater treatment and the low-level waste vitrification facilities were completed in 2001.

- **Area Hazards**

Figure 4.16a, *M-Area Map*, depicts the waste units and facilities located in M Area. The conceptual site models for M-Area are provided in Figures 4.16b.1, *M-Area CSM for Upper Three Runs Watershed*, and 4.16b.2, *M-Area CSM for Savannah River/Floodplain Swamp Watershed*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the M-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in M Area that require further evaluation and potential remediation are the M-Area Settling Basin Inactive Process Sewers to Manhole 1, Underground Sumps 321 M #001 and 321 M #002, 313-M and 320-M Inactive Clay Process Sewers to Tims Branch, Spill on 12/01/71 of 1,000 Gal of Rad Water from 773-A, M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion (Groundwater), and Savannah River Laboratory (SRL) Groundwater (Groundwater).

- **Area Cleanup Status**

Table 4.3a, RBES *Planned End State by Areas,* provides the current remedial status for the M-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go”

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phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 45 of the 53 M-Area waste units is complete (Table 4.3). For the remaining 8 "to go" waste units, five units are categorized as Hazard Type 4 (Inactive Process Sewer Lines), one as Hazard Type 9 (miscellaneous sites) and two as Hazard Type 10 (groundwater). Hazard sources to be evaluated for the remaining M-Area waste units include a variety of radioactive releases, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. Figures 4.1a, *Upper Three Runs Map*, and 4.6a, *Savannah River/Floodplain Map*, and 4.16a, *M-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.16b.1,b, *M-Area CSM for Upper Three Runs Watershed*, and 4.16b.2, *M-Area CSM for Savannah River/Floodplain Swamp Watershed*. The M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion and SRL Groundwater are the two remaining groundwater units in M Area. These groundwater plumes are commingled and encompass approximately 8.0 km^2 (3.0 mi^2). This groundwater contamination underlies a large portion of A/M Area, but it is presented here in the M-Area discussion to avoid repetition. Groundwater associated with the M-Area Hazardous Waste Management Facility: A/M Area Groundwater Portion has been impacted by A/M-Area operations. VOC contamination (trichloroethene, perchloroethylene, and 1,1,1-trichloroethane) is present above MCLs in this groundwater unit.

The SRL Groundwater OU addresses contaminated groundwater beneath the Savannah River Technology Center (SRTC) (formerly SRL) complex. Operations in research and laboratory facilities within the complex resulted in the release of contaminants (including volatile organic compounds [VOCs] and radionuclides above MCLs) to the subsurface. This groundwater plume extends towards Tims Branch beneath the unnamed tributary located east of A Area. There is no indication at this time that the plume has impacted surface water.

The remediation program for both groundwater units includes a series of soil vapor extraction units, a network of recovery and recirculation wells, and innovative remedial technologies.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for M-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

All structures in M Area will be demolished as part of the EM Closure Project. Below is a table showing the number of nuclear, radiological and industrial facilities in M Area. End states are shown as either demolished or in situ.

M Area Totals			**Current Status**	**End State**	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	0	0	0	0	0
Rad	2	32,490	0	2	0
Oth Ind	18	308,647	0	18	0
Total	20	341,137	0	20	0

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.12 N Area

- **Area Description**

N Area was previously designated Central Shops and consists of about 10.4 ha (100 ac) of buildings and storage areas centrally located between the reactors and separations areas. Many of the N-Area facilities have been retired and have been designated as waste units. All N-Area waste units are located in the Fourmile Branch Watershed. The current land use for N Area is site industrial.

- **Mission Description**

N Area contains construction services facilities such as electrical, mechanical, material and equipment lay-down yards to store items until needed for new construction. In addition to construction facilities, procurement and materials management facilities are located in this area. N Area also contains some of the hazardous waste storage facilities for the site, which involves three primary operations: receipt of waste from onsite generators, interim storage, and shipment of the waste for offsite treatment and disposal. N Area is primarily comprised of heavy industrial, administrative, health and safety, and warehouse facilities. The warehouse facilities function to provide material coordination, material acquisition, and material processing for the entire site. Most N-Area facilities were originally constructed in the early 1950s and continue to provide adequate accommodations for their intended missions.

- **Area Hazards**

Figure 4.17a, *N-Area Map*, depicts the waste units and facilities located in N Area. Because N Area is positioned on a topographic and hydrogeologic divide two conceptual site models for N-Area are provided in Figure 4.17b.1, *N-Area CSM for Fourmile Branch Watershed*, and 4.17b.2, *N-Area CSM for Pen Branch Watershed*, depicting the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the N-Area waste units with associated characteristics. There are no major hazards in N Area that require remediation.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the N-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 13 of the 24 N-Area waste units is complete (Table 4.3). For the remaining 11 “to go” waste units, eight units are categorized as Hazard Type 5 (Nonradiological Rubble Piles and Pits), one unit as Hazard Type 6 (Nonradiological Seepage Basins), and two units as Hazard Type 9 (Miscellaneous Sites). Hazard sources to be evaluated for the remaining N-Area waste units include nonradioactive rubble and building debris, organic and inorganic constituents.

During waste unit investigations, evidence of sporadic and trace levels of organic groundwater concentrations have been observed (see Figure 4.17a, *N-Area Map*). Further assessment/investigation is currently being considered to determine whether or not this is a concern.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for N-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

- **Mission and Facility End State**

N Area will remain active throughout the planning period as an industrial support area. This area would be used to consolidate maintenance activities near the center of the site, including excess warehousing operations and vehicle support maintenance from M Area. However, if there is no turnover to NNSA or major new missions, completion of the EM Closure Project will make most of the buildings and structures in N Area surplus, and any surplus building or structure will be demolished by 2025.

Below is a table showing the number of nuclear, radiological and industrial facilities in N Area. End states are shown as either demolished or in situ.

N Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	5	53,116	0	5	0
Rad	0	0	0	0	0
Oth Ind	78	864,111	0	78	0
Total	83	917,227	0	83	0

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.13 P Area

- **Area Description**

P Area is located in an upland area between Meyers Branch and Steel Creek approximately 4.1 km (2.5 mi) east-southeast of the geographical center of SRS and about 6.4 km (4 mi) west of the nearest site boundary. P-Area waste units are located in both the Steel Creek and the Lower Three Runs Watersheds.

P Area has been declared as an excess facility, and the current land use for P Area is site industrial.

- **Mission Description**

P Area is one of five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. P Reactor is similar to other SRS reactors and has two functional areas, referred to as the exclusion area and the administrative area. The reactor exclusion area contains production buildings and facilities necessary for operational support. The area surrounding the exclusion area contains the administrative support facilities and the cooling water storage basins. The entire reactor area, both exclusion and administrative areas, is enclosed by fencing to form an operations/administrative compound. P Area is permanently shut down with no future mission. P Area is primarily comprised of industrial, administrative, and some warehouse facilities. Most facilities were constructed in the early 1950s.

The disassembly area within the 105-P facility consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains several million gallons of water, and in the past it allowed the target and fuel assemblies to undergo natural radioactive decay after neutron irradiation. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-P Disassembly Basin.

- **Area Hazards**

Figure 4.18a, *P-Area Map*, depicts the waste units and facilities located in P Area. Because P Area resides on a topographic and hydrogeologic divide, two conceptual site models for P-Area are provided in Figures 4.18b.1, *P-Area CSM for Lower Three Runs Watershed*, and 4.18b.2, *P-Area CSM for Steel Creek Watershed*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the P-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in P Area that require further evaluation and potential remediation are the P-Area Process Sewer Lines, P-Area Disassembly Basin, P-Reactor Seepage Basins, P-Reactor Discharge Canal, P-Reactor Area Cask Car Railroad Tracks and P-Reactor Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the P-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

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Remediation for 18 of the 30 P-Area waste units is complete (Table 4.3). For the remaining 12 "to go" waste units, six units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), two units as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), one unit as Hazard Type 4 (Inactive Process Sewer Lines), two units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining P-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. P-Area Groundwater is the only groundwater waste units in the "to go" phase. Figures 4.4a, *Steel Creek Map*, and 4.5a, *Lower Three Runs Map* and 4.18a, *P-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.18b.1, *P-Area CSM for Lower Three Runs Watershed* and 4.18b.2, *P-Area CSM for Steel Creek Watershed*. The source of the P-Area Groundwater OU is the P-Reactor Area. Monitoring well data collected from the reactor area indicate the groundwater is contaminated with tritium, chlorinated VOCs, radionuclides, heavy metals and sulfate. Various former maintenance facilities in the P Reactor Area are the most likely contributors of the VOC contamination. P-Area groundwater with contaminants above MCLs has the potential to impact the Steel Creek IOU at the headwaters of Steel Creek and Meyers Branch. The groundwater investigation is entering the next phase to define the extent of the contaminant plumes, and results will be evaluated with regards to IOU impact in the next IOU periodic report.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for P-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End** *State*

All hardened reactor facilities will be deactivated. All non-hardened support buildings and administrative buildings will be demolished. All temporary buildings and trailers will be removed. The Disassembly Basin will be decommissioned with an environmental cap installed. A fence around the perimeter of the remaining facilities will secure the 105-P complex in conjunction with other institutional controls..

Below is a table showing the number of nuclear, radiological and industrial facilities in P Area. End states are shown as either demolished or in situ.

P Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	0	0	0	0	0
Rad	1	385,010	0	0	1
Oth Ind	19	272,911	0	11	8
Total	20	657,921	0	11	9

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.14 R Area

- **Area Description**

R Area is a 10.22 ha (25.25 ac) area located approximately 4.0 km (2.5 mi) northeast of the geographical center of SRS. R-Area waste units are located in both the Lower Three Runs and Upper Three Runs Watersheds. In 1994, several of the support buildings including the silos were demolished and removed. The current land use for R Area is site industrial.

- **Mission Description**

R Area is the oldest of the five SRS reactor areas with the original mission of producing material for the Department of Defense nuclear weapons program. The R-Area production reactor is permanently shutdown; however, the R Reactor Building currently serves as a storage area for drums of depleted uranium. R Area is primarily comprised of nuclear industrial, administrative, and warehouse facilities. Most facilities were originally constructed in the early 1950s.

The disassembly area within the 105-R facility consists primarily of a water-filled basin with metal racks designed for vertical storage of fuel tubes and metal buckets for storing targets during operations. The basin contains about 4.5 million gallons of water and in the past the basin allowed target and fuel assemblies to undergo natural radioactive decay after neutron irradiation. Currently, no irradiated or unirradiated fuel or targets are stored in the 105-R Disassembly Basin. In the past 2 years the basin water has been processed in-situ to remove the majority of the cesium-137 and strontium-90 using innovative nuclide-specific ion-exchange technology.

- **Area Hazards**

Figure 4.19a, *R-Area Map*, depicts the waste units and facilities located in R-Area. Because R Area resides on a topographic and hydrogeologic divide, two conceptual site models for the R Area are provided in Figure 4.19.b1, *R-Area CSM for Lower Three Runs Watershed*, and Figure 4.19b.2, *R-Area CSM for Upper Three Runs Watershed*, and depict the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the R-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in R Area that require further evaluation and potential remediation are the R- Area Process Sewer Lines, R-Area Disassembly Basin, the Old R-Area Discharge Canal, R-Area Reactor Disassembly Basin Release and R-Area Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the R-Area waste units and the remedial technology implemented for completed units. For waste units in the "to go" phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the "to go" units" to a hazard type CSM located in Appendix D, *Conceptual Site Models for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The "to go" waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for 10 of the 33 R-Area waste units is complete (Table 4.3). For the remaining 23 "to go" waste units, eight units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits), one unit as Hazard Type 3 (Coal Pile Runoff Basins and Ash Basins), two units as Hazard Type 4 (Inactive Process Sewer Lines), five units as Hazard Type 5 (Nonradiological Rubble Piles and Pits), six units as Hazard Type 9 (Miscellaneous Sites), and one unit as Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining R-Area waste units include radionuclides, nonradioactive rubble and building debris, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. R-Area Groundwater and the R-Reactor Seepage Basins are R-Area groundwater waste units in the "to go" phase. Groundwater beneath R Area has been contaminated by leaching of volatile organic compounds and radionuclides from area waste units above drinking water standards. Figures 4.1a, *Upper Three Runs Map*, and 4.5a, *Lower Three Runs Map*, and 4.19a, *R-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figures 4.19b.1, *R-Area CSM for Lower Three Runs Watershed*, and 4.19b.2, *R-Area CSM for Upper Three Runs Watershed*. Groundwater characterization for R Area is ongoing and impacts to the Lower Three Runs Watershed have not been defined.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for R-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

All hardened reactor facilities will be deactivated. The depleted uranium will be removed from the 105-R Building and transported to another area. All remaining non-hardened support buildings will be demolished. The Disassembly Basin will be decommissioned with an environmental cap installed.

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A fence around the perimeter of the remaining facilities will secure the 105-R Complex.

Below is a table showing the number of nuclear, radiological and industrial facilities in R Area. End states are shown as either demolished or in situ.

R Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	2	389,775	0	1	1
Rad	1	245	0	0	1
Oth Ind	8	409,707	0	0	8
Total	11	799,727	0	1	10

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan,* Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.15 S Area

- **Area Description**

S-Area waste facilities are located in the Upper Three Runs Watershed. The current land use for S-area is site industrial.

- **Mission Description**

All facilities located in this area are related to High Level Waste (HLW) immobilization and interim storage. Current facilities include Defense Waste Processing Facility (DWPF), Glass Waste Storage Building (GWSB) #1, Failed Equipment Storage Vaults, and other support structures (offices, maintenance shops, equipment/material storage, etc.).

DWPF receives pretreated, high-level radioactive waste from HTF and eventually from the Salt Processing Facility and converts it, in a process called vitrification, to a stable form for safe long-term disposal. The vitrified waste is poured into stainless steel canisters that are then cooled, welded, and stored in the GWSB.

DWPF melters are operated until they fail. Failed melters are placed in specially designed storage boxes and temporarily stored in Failed Equipment Storage Vaults.

- **Area Hazards**

Figure 4.20a, *S-Area Map*, depicts the waste units and facilities located in S Area. The conceptual site model for S-Area is provided in Figure 4.20b, *S-Area CSM for Upper Three Runs Watershed*, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the S-Area waste units with associated characteristics. G-Area waste units were previously discussed with the appropriate watershed. There are no major hazards in S Area that require remediation.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas,* provides the current remedial status for the S-Area waste units and the remedial technology implemented for completed units. Remediation is complete for all S-Area waste units.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current end state for S-Area waste units accommodates a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker.

- **Mission and Facility End State**

DWPF and SWPF will be deactivated by isolating utilities and filling the canyon cells with grout. In addition, all waste transfer systems and the Failed Equipment Storage Vaults will be deactivated by isolating utilities and filling with grout. Both GWSB 1 & 2 will be deinventoried. The superstructure for each of these buildings will be removed, leaving the empty underground vaults with plugs in place.

S Area will be deactivated as prelude to in-situ disposal. The structural integrity of all waste transfer pipes and systems as well as storage vaults will be stabilized with grout. The superstructure surrounding the glass waste storage buildings will be removed, leaving the empty underground vaults with plugs in place. All other buildings and structures in S Area

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will be demolished as part of the EM Closure Project and a perimeter fence will secure the remaining S Area facilities..

Below is a table showing the number of nuclear, radiological and industrial facilities in S Area. End states are shown as either demolished or in situ.

S Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	17	383,157	0	15	2
Rad	1	225	0	1	0
Oth Ind	27	129,091	0	26	1
Total	45	512,473	0	42	3

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100,* and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan,* Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

4.2.16 T Area

- **Area Description**

The TNX Area is located 0.8 km (0.5 mi) east of the Savannah River on an upland terrace between Upper Three Runs to the north and Fourmile Branch to the south. The site is at an elevation of 46 m (150 ft) above msl. Local topography is relatively flat with a slope toward the east away from the Savannah River. A portion of the Savannah River floodplain lies immediately west of the TNX Area at 29 m (95 ft) above msl. All T-Area waste facilities are located in the Savannah River/Floodplain Swamp Watershed. The current land use for T Area is site industrial.

The TNX Area contains facilities and buildings and waste units that are located outside of the fenced TNX Area. The TNX Burying Ground (643-5G) was used to bury the remains of a 1953 accidental explosion of an experimental evaporator, which contained 544 kg (0.6 tons) of uranyl nitrate. The Old TNX Seepage Basin (904-76G) was in operation from 1951 through 1980. This facility was used to collect process wastewater, allowing settling of sediments in the small inlet basin and filtration through natural ion exchange media in the larger basin. Breaching the wall of the basin in 1980 released wastewater and sediments into the inner swamp, creating a delta of sediment that is now referred to as the Outfall Delta. The New TNX Seepage Basin (904-102G) replaced the Old TNX Seepage Basin after 1980.

- **Mission Description**

This area was originally used as a staging area for receipt and testing of large process equipment destined for use in SRS production facilities. In the early 1950s, it was used to test the plutonium/uranium extraction (PUREX) process. Since that time, T Area, also known as the Multi-Purpose Pilot Plant Campus or TNX, has been utilized primarily as a pilot-scale test facility for SRTC. The most significant pilot-scale testing support has been for high-level waste initiatives, particularly DWPF. Since 1978, the area has expanded from three original buildings constructed in 1950 to 32 buildings currently located within the 14-acre fenced facility. The area is primarily comprised of light industrial, administrative, and warehouse facilities.

The Multi-Purpose Pilot Plant Campus buildings include administrative offices, process buildings for large-scale experimental demonstrations, laboratories for both research and analytical work, pilot scale facilities, bulk tank storage, industrial wastewater processing facilities, and warehouse storage for a wide range of chemical and specialty equipment. The area has adequate infrastructure to perform a multitude of activities. Located outside of the fenced area are additional facilities, including closed underground storage tanks; the TNX Burying Ground and Seepage Basin, currently under evaluation by the ER Program; and the New TNX Seepage Basin.

The buildings are inactive and shutdown with deactivation either completed or underway in all but a few buildings. The SRS “Assets-for-Services” program has removed several buildings in T Area down to their foundation by trading the facility and its assets for decommissioning services.

- **Area Hazards**

Figure 4.21a, *T-Area Map*, depicts the waste units and facilities located in T Area. The conceptual site model for T-Area is provided in Figure 4.21b, *T-Area*

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CSM for Savannah River/Floodplain Swamp Watershed, and depicts the potential sources of contamination, migration pathways, exposure media and potential receptors. Table 4.3a, *RBES Planned End State by Areas*, provides a listing of the T-Area waste units with associated characteristics. With the exception of G-Area waste units previously discussed with the appropriate watershed, the major hazards in T Area that require further evaluation and potential remediation are the Old TNX Seepage Basin, TNX Burying Ground, TNX Process Sewer Lines, and TNX Groundwater.

- **Area Cleanup Status**

Table 4.3a, *RBES Planned End State by Areas*, provides the current remedial status for the T-Area waste units and the remedial technology implemented for completed units. For waste units in the “to go” phase where the response action has not been selected, Table 4.4, *RBES Hazard Type Crosswalk for Area "To Go" Units*, depicts a crosswalk that categorizes each of the “to go” units” to a hazard type CSM located in Appendix D, *Conceptual Site Model for Typical Hazards*. The hazard type CSMs list the remedial technologies likely to be implemented for each hazard type. The “to go” waste units will undergo characterization, risk analysis, and evaluation for the appropriate remedial technologies.

Remediation for eight of the 17 T-Area waste units is complete (Table 4.3). For the remaining nine “to go” waste units, three units are categorized as Hazard Type 2 (Radiological Seepage Basins and Pits),two units as Hazard Type 4 (Inactive Process Sewer Lines), three units as Hazard Type 9 (Miscellaneous Sites), and one Hazard Type 10 (Groundwater). Hazard sources to be evaluated for the remaining T-Area waste units include radionuclides, nonradioactive rubble and building debris, radionuclides, organic and inorganic constituents.

Remedial technologies for groundwater are presented with each Hazard Type CSM in Appendix D, *Conceptual Site Models for Typical Hazards*. Groundwater in T Area is contaminated with carbon tetrachloride, PCE, and TCE above MCLs with a potential to discharge to surface water. TCE has been detected at the seep line in the Savannah River Swamp where the groundwater plume crops out. However, no constituents from the plume have been detected in the Savannah River or any offsite groundwater. Groundwater is also contaminated with chloroform above risk-based levels but does not exceed MCLs and therefore does not require action. There is also a small region of mercury contamination in the groundwater that generally exceeds the MCL with no discernable source. Figure 4.6a, *Savannah River/Floodplain Map*, and 4.21a, *T-Area Map*, show the aerial extent of the groundwater contamination. In addition, the groundwater pathways with impacted media and receptors are shown on Figure 4.21b, *T-Area CSM for Savannah River/Floodplain Swamp Watershed*. Groundwater characterization for T Area is ongoing and impacts to the Savannah River/Floodplain Swamp Watershed have not defined.

- **Area Planned End State Hazards**

See *End State for Soil and Water Cleanup* above for a general discussion. The current and projected end state for T-Area waste units is to accommodate a final risk level of 10^{-4} to 10^{-6} with institutional controls for the industrial worker and below MCLs for groundwater.

- **Mission and Facility End State**

All buildings and structures in T Area will be demolished and any contamination of the soil and groundwater will be addressed. Below is a table showing the number of nuclear, radiological and industrial facilities in T Area. End states are shown as either demolished or in situ.

T Area Totals			Current Status	End State	
Facility Haz Type	No.	Sq Ft	Comp	DEM	ISD
Nuc	0	0	0	0	0
Rad	0	0	0	0	0
Oth Ind	29	161,732	24	29	0
Total	29	161,732	24	29	0

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

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4.2.17 Z Area

- **Mission Description**

Z Area is composed of operating facilities used to treat and dispose of the low radioactivity salt solution resulting from selected salt disposition alternative pre-treatment processes and the concentrate from ETF. The area includes the Saltstone Manufacturing Plant and Saltstone Disposal Vaults. Z Area is primarily comprised of light nuclear industrial, administrative, and warehouse facilities. Currently, the Saltstone Facility is restarting to process accumulated feed from ETF. The Saltstone Manufacturing Plant blends a low radioactivity salt solution with cement, slag, and fly ash to create a mixture that hardens into a concrete-like material called saltstone. It treats liquid waste residuals from ETF. This plant works in conjunction with the Saltstone Disposal Vaults, large concrete disposal crypts into which the solution prepared in the Saltstone Manufacturing Plant is pumped. After cells in the vault are filled, they are sealed with concrete. Eventually, the vaults will be covered with soil, and a cap constructed of clay and other materials will be installed over the vaults to reduce rainwater infiltration and leaching of contaminants into the groundwater.

- **Area Hazards**

There are no waste units in Z Area.

- **Area Cleanup Status**

Since there are no waste units in Z Area, there is no remediation ongoing or planned.

- **Mission and Facility End State**

The grout plant will be closed by isolating process equipment and filling with grout where appropriate. All administrative facilities will have been deactivated and decommissioned, and above ground support systems, which present significant hazards, will have been removed. A perimeter fence will secure the remaining Z-Area facilities.

Below is a table showing the number of nuclear, radiological and industrial facilities in Z Area. End states are shown as either demolished or in situ.

Z Area Totals			Current Status	End State	
Facility Haz Type	**No.**	**Sq Ft**	**Comp**	**DEM**	**ISD**
Nuc	4	191,102	0	2	2
Rad	0	0	0	0	0
Oth Ind	10	17,553	0	10	0
Total	14	208,655	0	12	2

NOTE: Information provided in this table is based on the *DOE/WSRC Contract No. DE-AC09-96R18500, Modification Number 100*, and *the Savannah River Site Environmental Management Integrated Deactivation and Decommissioning Plan*, Rev. 1, September 30, 2003. Current status is shown facilities completed as of the end of fiscal year 2003 (September 30, 2003).

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APPENDIX A

REGIONAL AND SITE MAPS

Map Number	Figure Name	Extent	Context
2.1a	Regional Physical and Surface Interface - Current State (2003)	Regional	Physical & Surface
2.2a	Regional Human and Ecological Land Use - Current State (2003)	Regional	Human & Ecological
2.3a	Regional Watershed Map - Current State (2003)	Regional	Watersheds
3.1a	Site Physical and Surface Interface - Current State (2003)	Site	Physical & Surface
3.2a	Site Human and Ecological Land Use - Current State (2003)	Site	Human & Ecological
3.3a	Site Legal Ownership - Current State (2003)	Site	Legal Ownership
3.4a	Site Site Demographics - Current State (2003)	Site	Demographics
3.5a	SRS Watershed Map - Current State (2003)	Site	Watersheds
3.6a	Future Development – Suitable for Industrial Missions	Site	Site Wide
4.0a	Site-wide Hazard Map - Current State (2003)	Hazard	Site Wide

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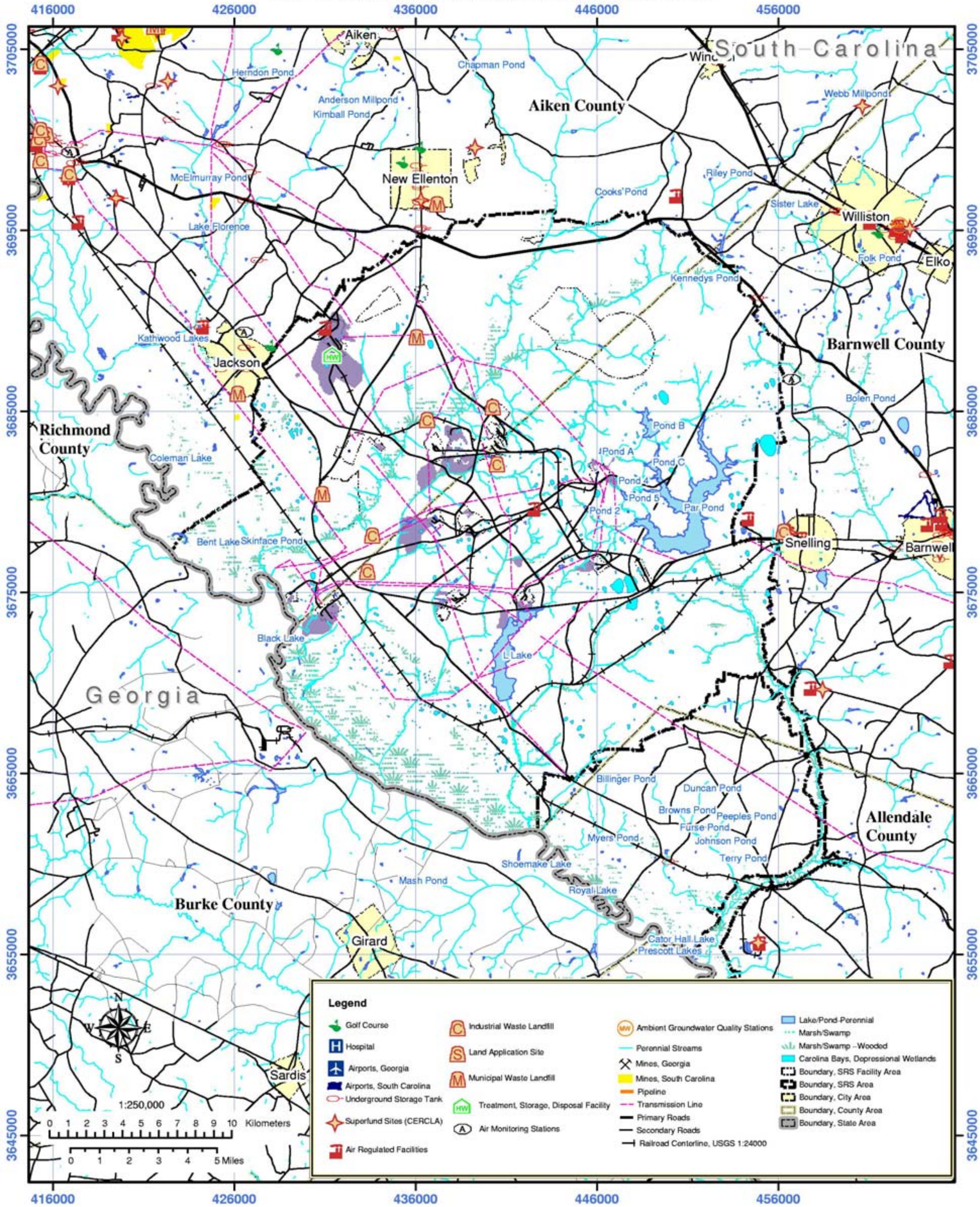
Savannah River Site

2.1a – Regional Physical and Surface Interface – Current State



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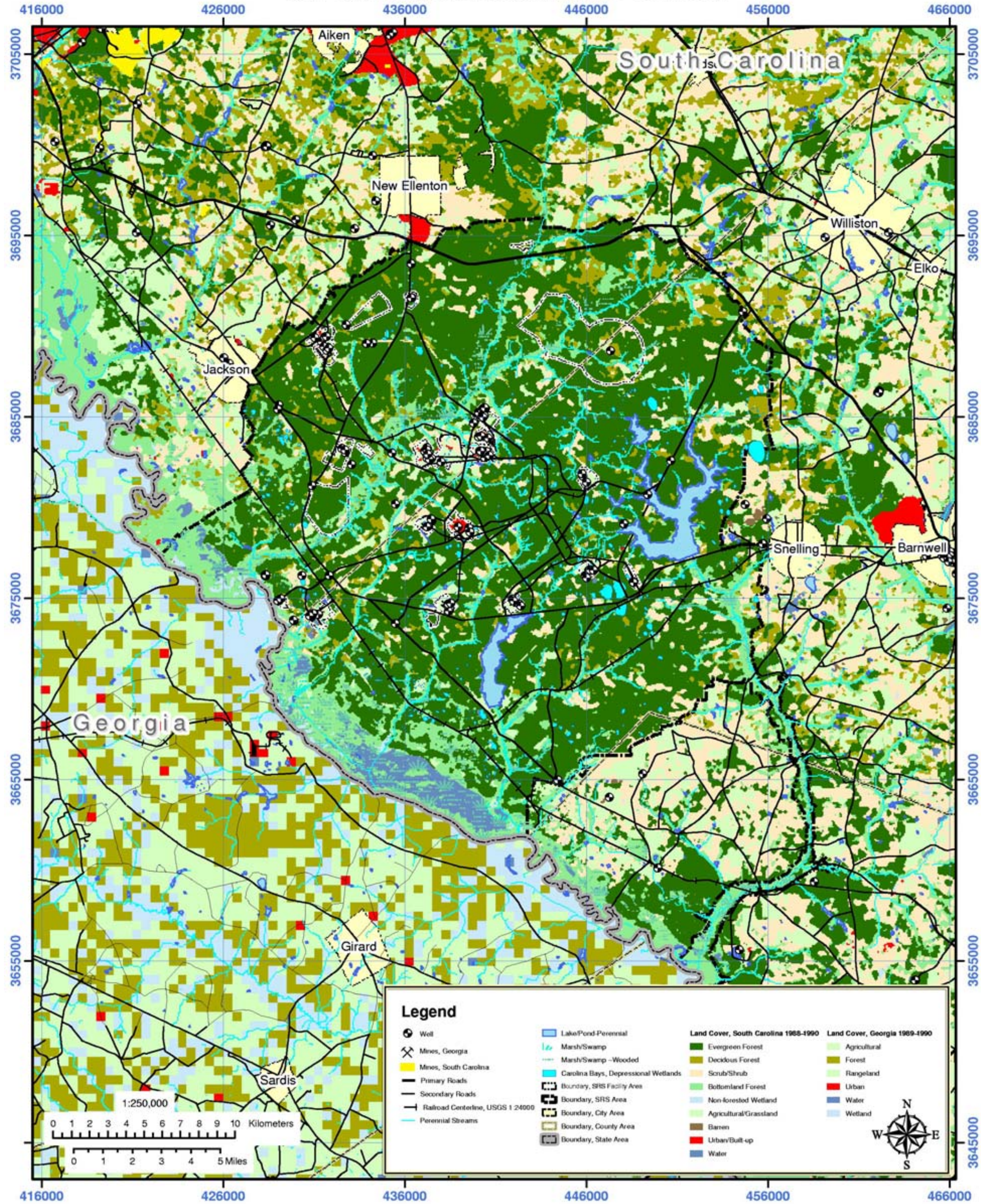
Savannah River Site
2.2a – Regional Physical and Surface Interface – Current State



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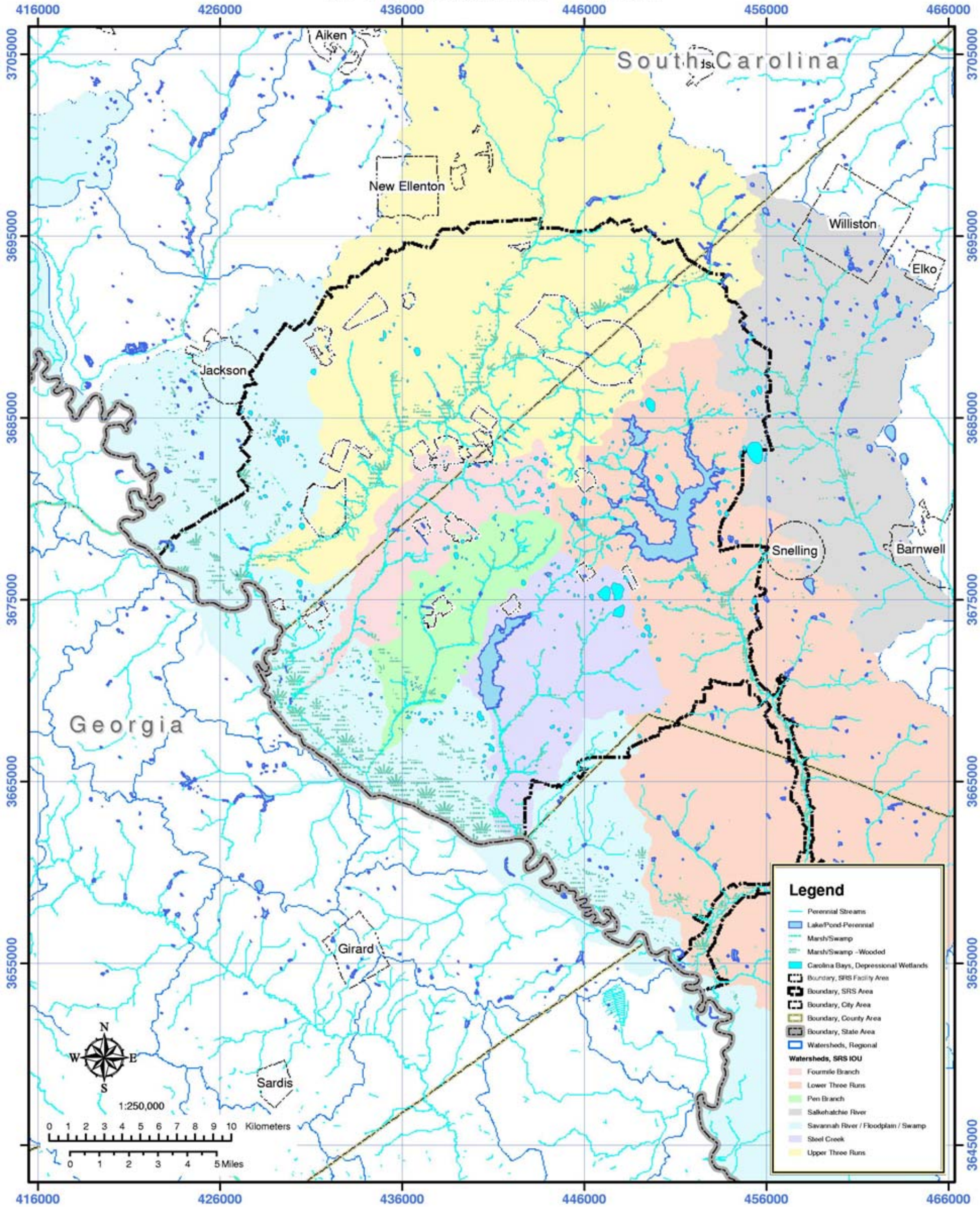
Savannah River Site
2.3a – Regional Watershed Map – Current State



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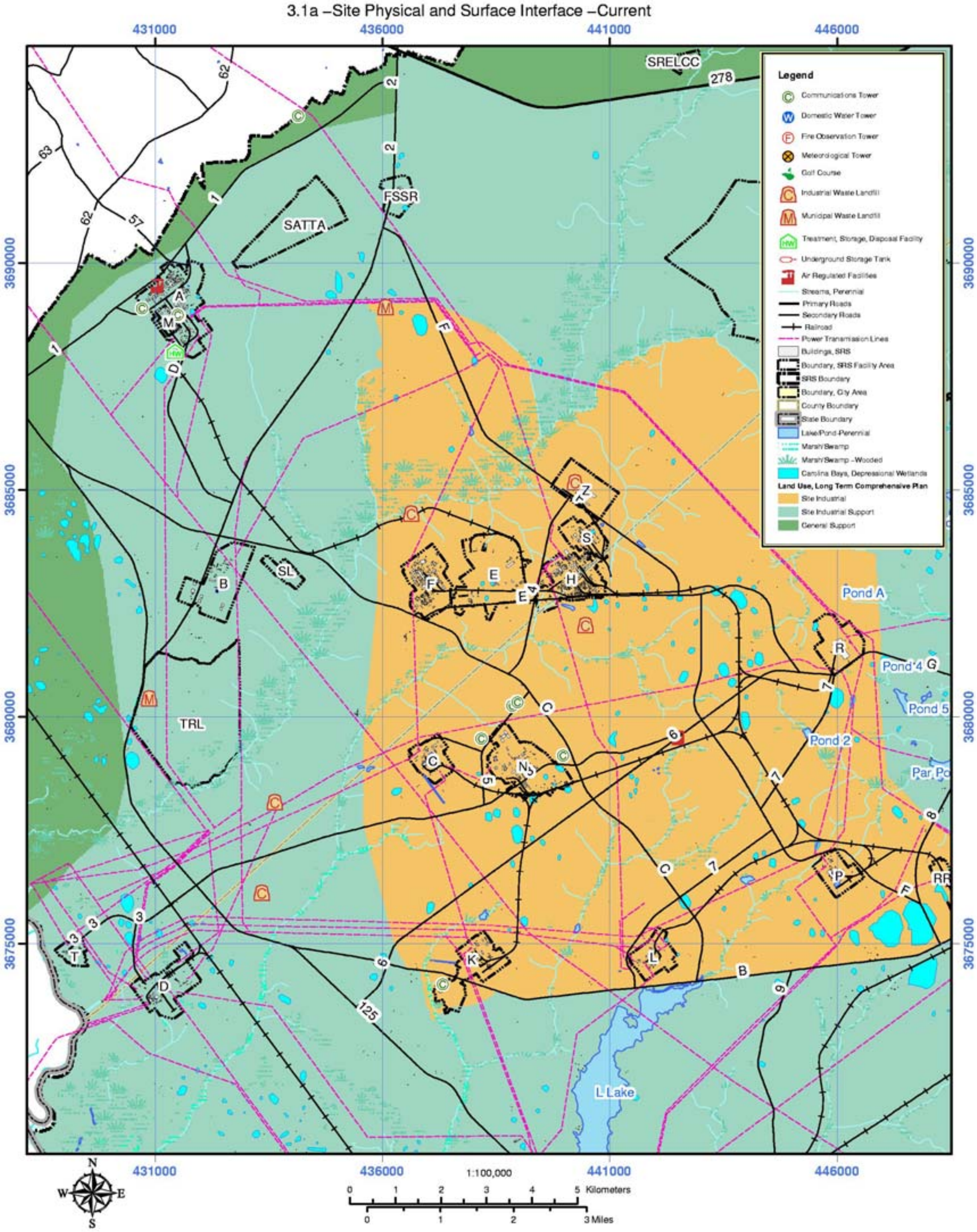
Savannah River Site

3.1a – Site Physical and Surface Interface – Current



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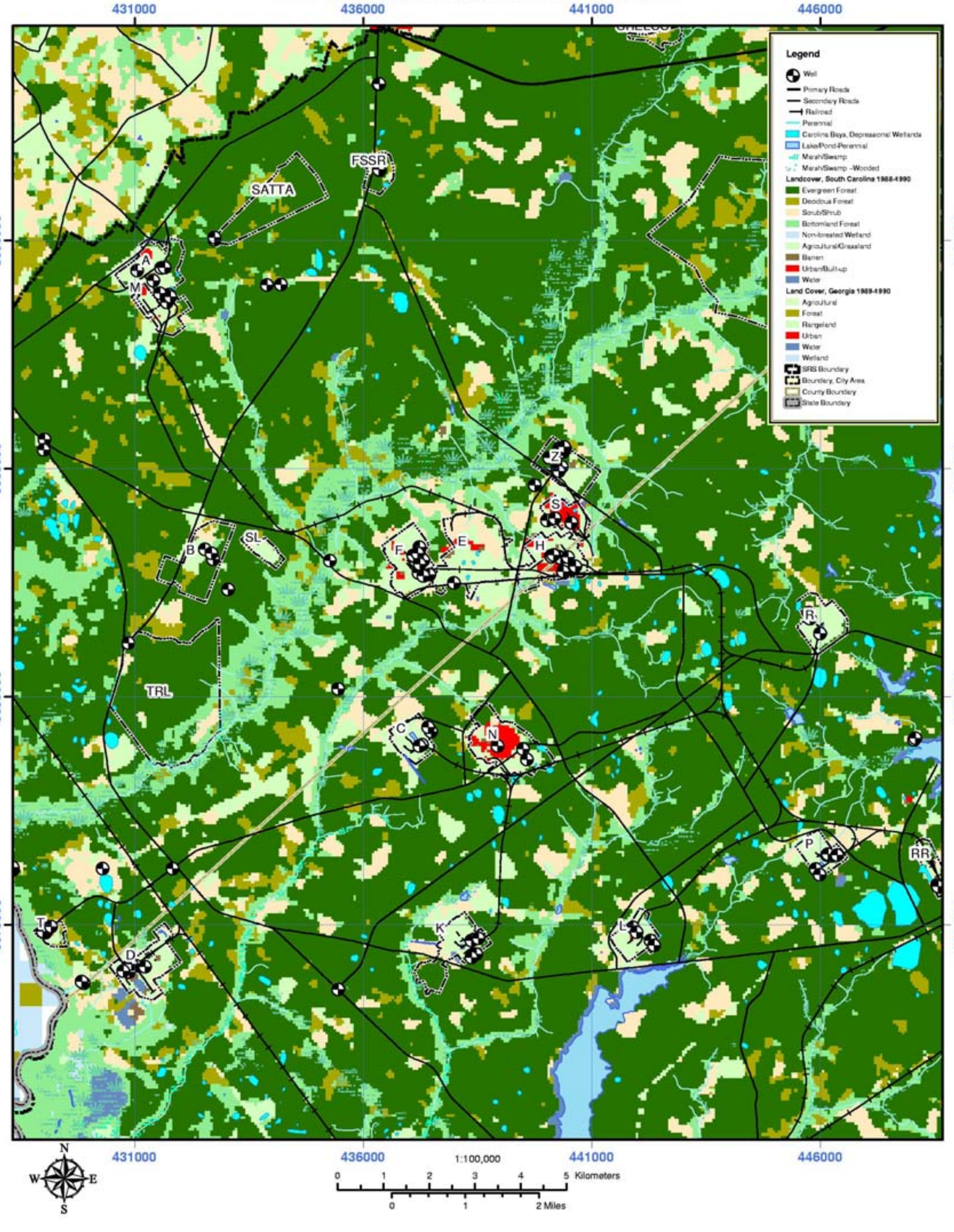
Savannah River Site
3.2a –Site Human & Ecological Land Use–Current State



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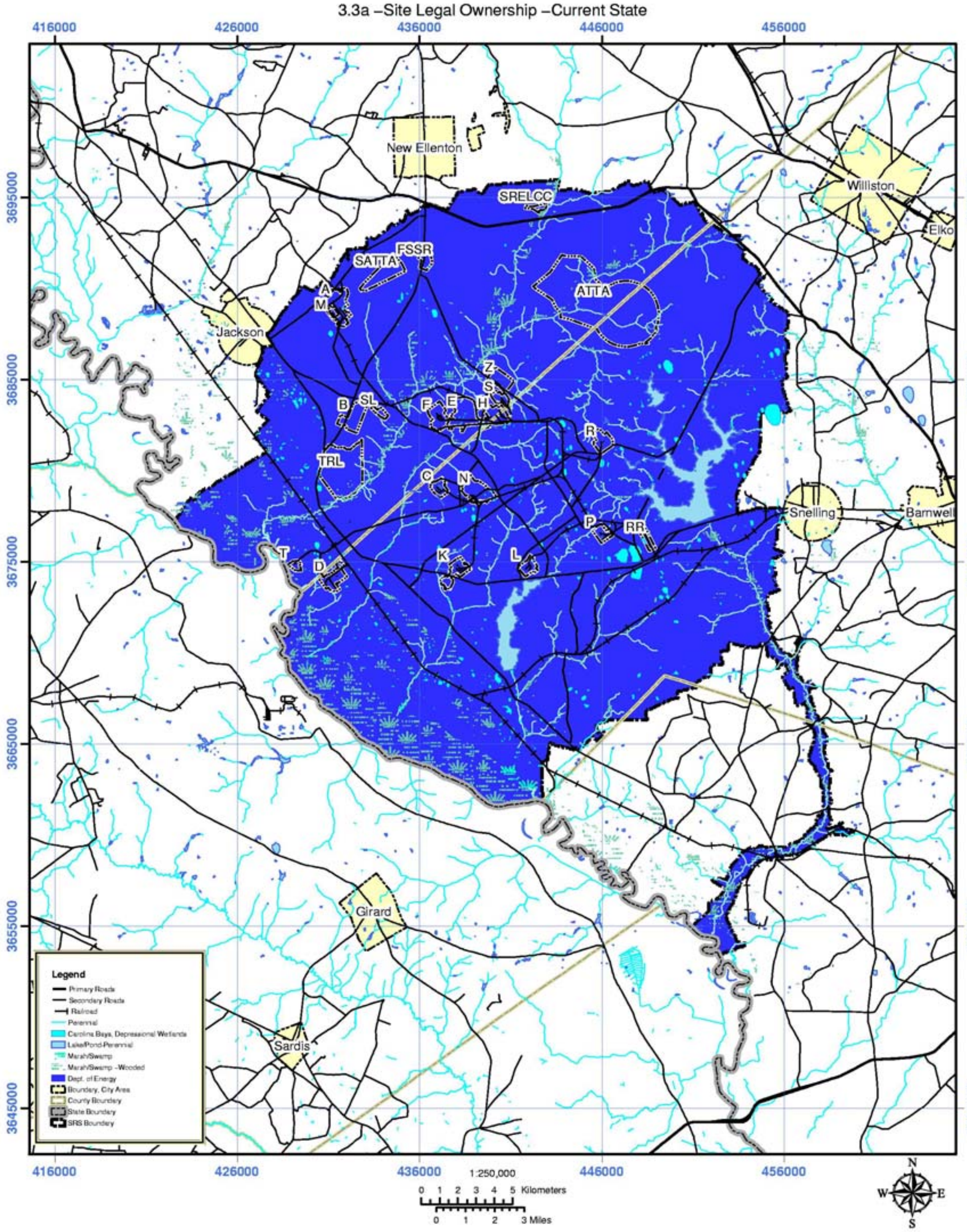
Savannah River Site

3.3a –Site Legal Ownership –Current State



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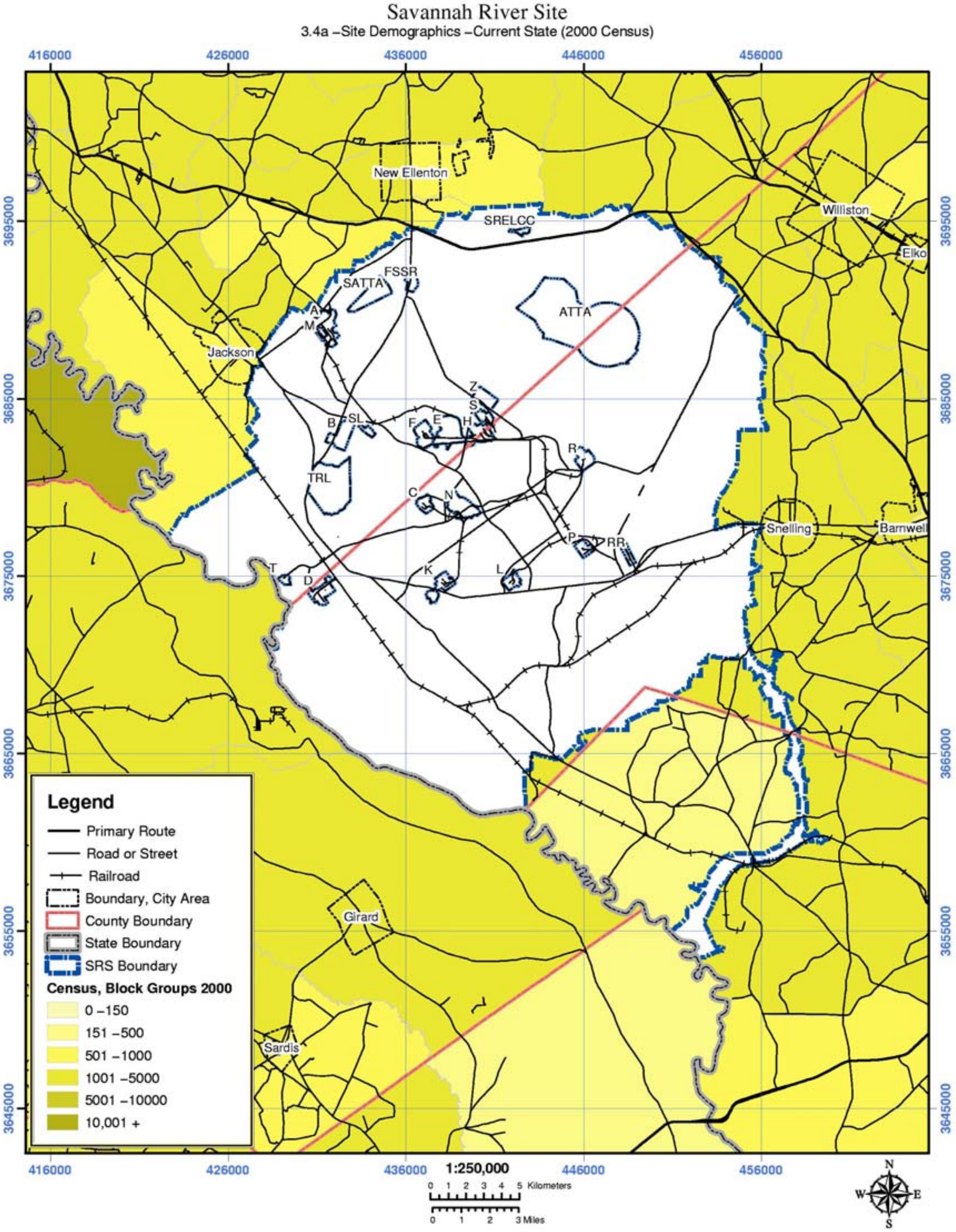
Savannah River Site
3.4a – Site Demographics – Current State (2000 Census)
New Ellenton
SRELCC
Williston
Elko
SATTA
FSSR
ATTA
Jackson
A
M
Z
S
B
SL
F
E
H
R
TRL
C
N
Snelling
Barnwell
P
RR
T
D
K
L
Girard
Sardis
Legend
Primary Route
Road or Street
Railroad
Boundary, City Area
County Boundary
State Boundary
SRS Boundary
Census, Block Groups 2000
0 – 150
151 – 500
501 – 1000
1001 – 5000
5001 – 10000
10,001 +
1:250,000
Kilometers
Miles
N
S
E
W

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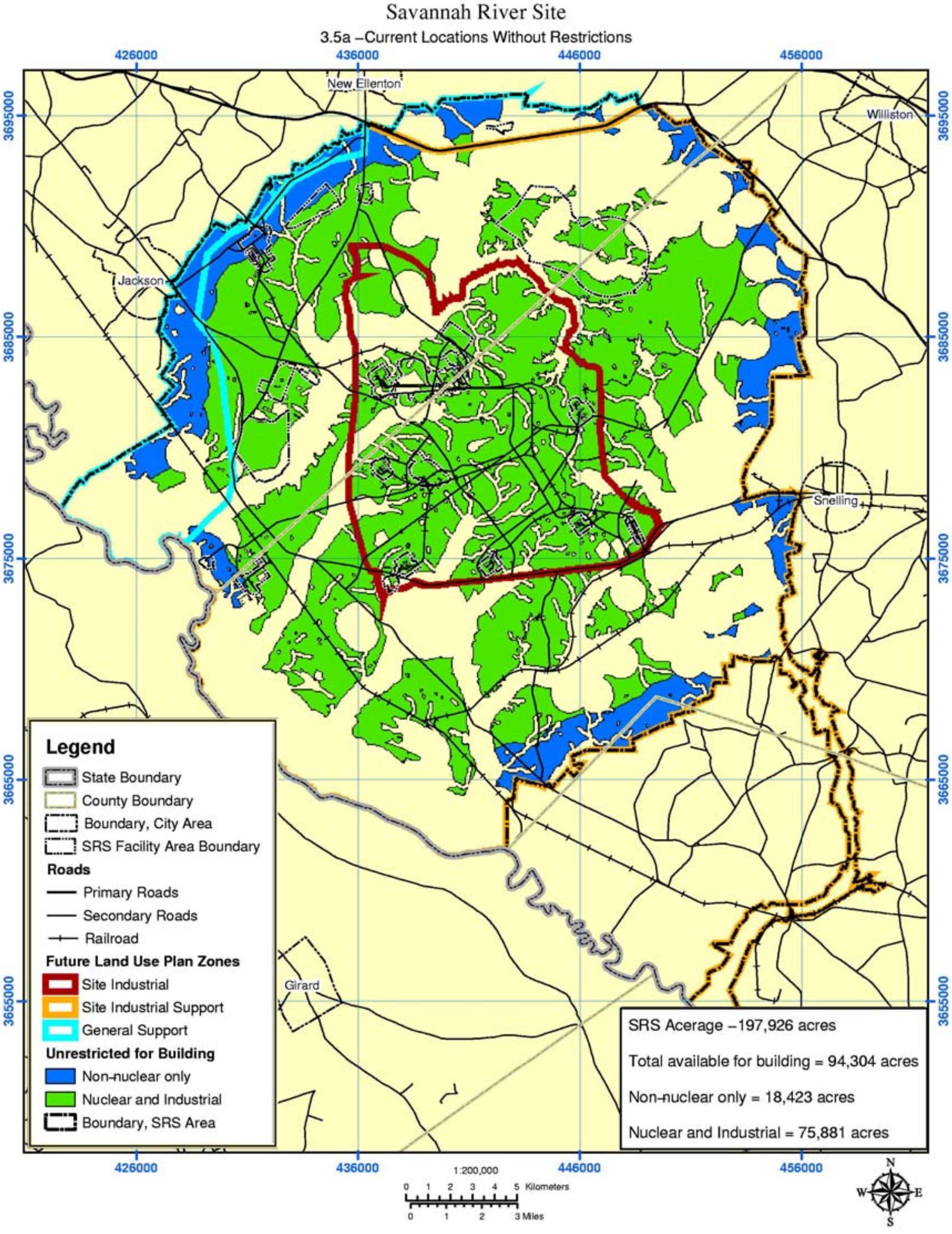
Savannah River Site
3.5a – Current Locations Without Restrictions
426000
436000
446000
456000
3695000
3685000
3675000
3665000
3655000
New Ellenton
Williston
Jackson
Snelling
Girard
Legend
State Boundary
County Boundary
Boundary, City Area
SRS Facility Area Boundary
Roads
Primary Roads
Secondary Roads
Railroad
Future Land Use Plan Zones
Site Industrial
Site Industrial Support
General Support
Unrestricted for Building
Non-nuclear only
Nuclear and Industrial
Boundary, SRS Area
SRS Acerage – 197,926 acres
Total available for building = 94,304 acres
Non-nuclear only = 18,423 acres
Nuclear and Industrial = 75,881 acres
1:200,000
0 1 2 3 4 5 Kilometers
0 1 2 3 Miles
N
W
E
S

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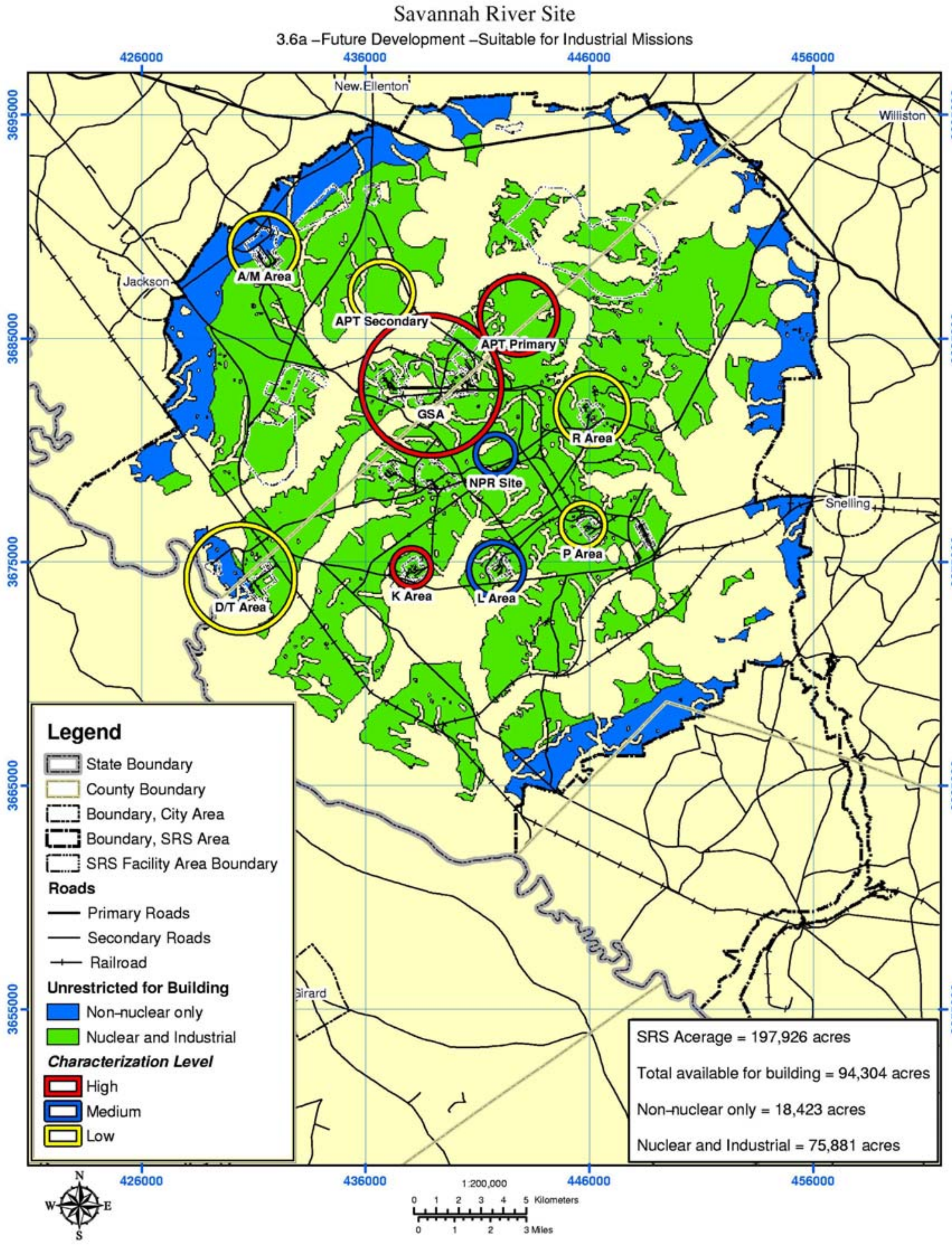
Savannah River Site
3.6a –Future Development –Suitable for Industrial Missions
426000
436000
446000
456000
3695000
3685000
3675000
3665000
3655000
New Ellenton
Williston
Jackson
A/M Area
APT Secondary
APT Primary
GSA
R Area
NPR Site
Snelling
P Area
K Area
L Area
D/T Area
Girard
Legend
State Boundary
County Boundary
Boundary, City Area
Boundary, SRS Area
SRS Facility Area Boundary
Roads
Primary Roads
Secondary Roads
Railroad
Unrestricted for Building
Non-nuclear only
Nuclear and Industrial
Characterization Level
High
Medium
Low
SRS Acerage = 197,926 acres
Total available for building = 94,304 acres
Non-nuclear only = 18,423 acres
Nuclear and Industrial = 75,881 acres
1:200,000
0 1 2 3 4 5 Kilometers
0 1 2 3 Miles
N
S
E
W

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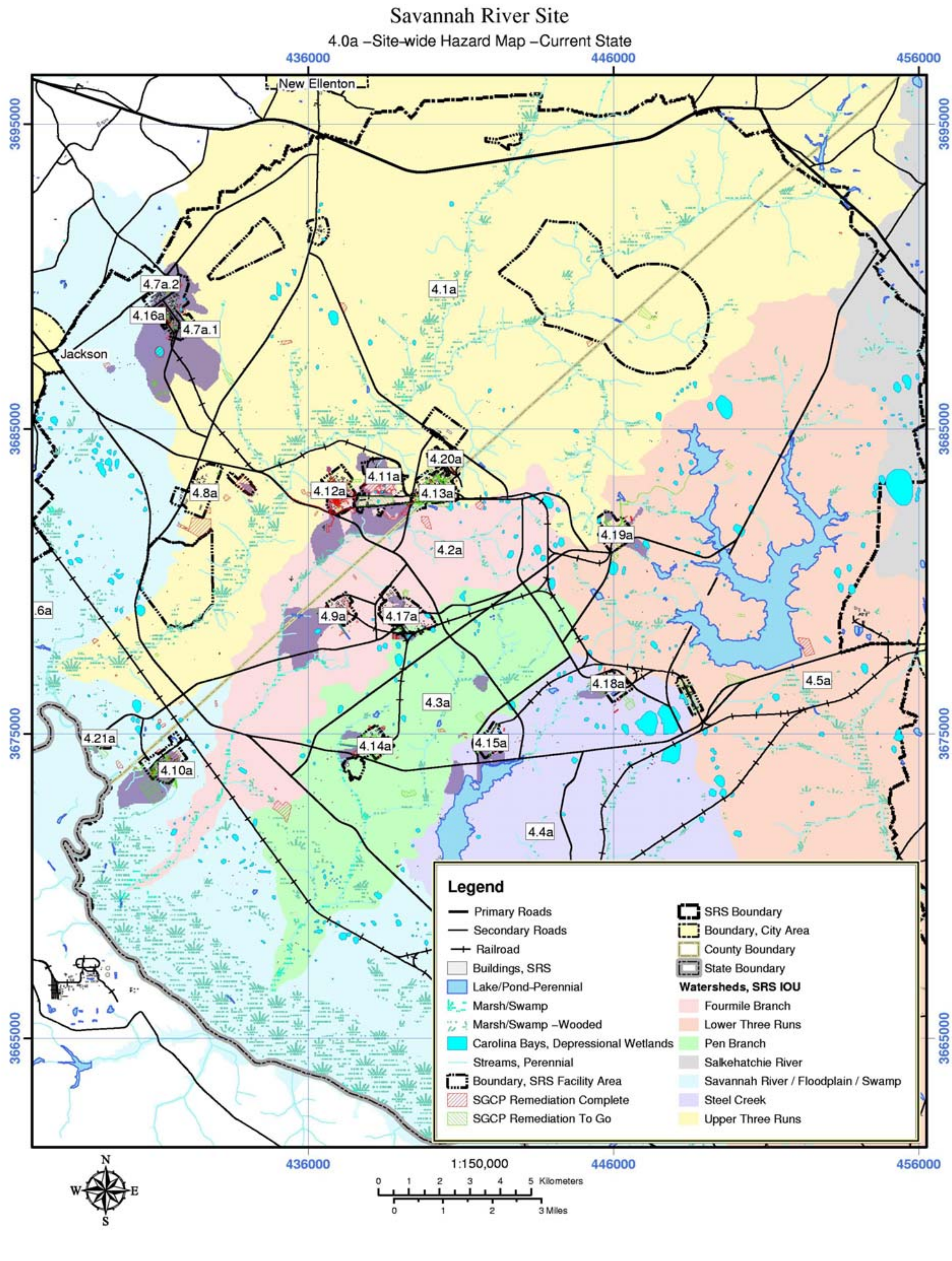
Savannah River Site
4.0a – Site-wide Hazard Map – Current State
436000
446000
456000
3695000
3685000
3675000
3665000
New Ellenton
Jackson
4.1a
4.2a
4.3a
4.4a
4.5a
.6a
4.7a.1
4.7a.2
4.8a
4.9a
4.10a
4.11a
4.12a
4.13a
4.14a
4.15a
4.16a
4.17a
4.18a
4.19a
4.20a
4.21a
Legend
Primary Roads
Secondary Roads
Railroad
Buildings, SRS
Lake/Pond-Perennial
Marsh/Swamp
Marsh/Swamp – Wooded
Carolina Bays, Depressional Wetlands
Streams, Perennial
Boundary, SRS Facility Area
SGCP Remediation Complete
SGCP Remediation To Go
SRS Boundary
Boundary, City Area
County Boundary
State Boundary
Watersheds, SRS IOU
Fourmile Branch
Lower Three Runs
Pen Branch
Salkehatchie River
Savannah River / Floodplain / Swamp
Steel Creek
Upper Three Runs
1:150,000
0 1 2 3 4 5 Kilometers
0 1 2 3 Miles
N
S
E
W

APPENDIX E

VARIANCES AND RECOMMENDATIONS

Variance Definition and Application at SRS

SRS recommends five variances with recommendations for implementation. The SRS EM Performance Management Plan (PMP) that was issued August 7, 2002 is considered to be the SRS EM Cleanup project baseline. **For the purposes of this document, a variance is defined as a significantly different cleanup approach or different end state relative to the SRS EM PMP.**

It is important to note that the proposed variances and recommendations are considered to be "enablers" to accomplish the EM Cleanup project by 2025 within the desired out year funding targets. Currently the SRS EM life cycle baseline (technical scope, cost and schedule) is in the process of validation. After baseline validation, the variances will be reassessed for changes to the EM Cleanup project baseline.

The following Variances with associated implementation recommendations are submitted for consideration:

- Future Land Use and Exposure Scenario Modification
- Area Risk Methodology and Protocols
    - Area-wide Multimedia Environmental Model (Alternative Project) and Deactivation Risk Assessment Accelerated Closure
- Alternate Disposal for Pu-238 Contaminated Waste
- In Situ Decommissioning in lieu of Demolition
- Revise "glass durability" Waste Acceptance Criteria for the high level waste federal repository

Barriers to RBES Vision Success

High Level Waste classification is the single largest barrier to the accelerated cleanup program. The issue is: "Can incidental amounts of high level waste be reclassified for near surface disposal (similar to the two closed HLW tanks at SRS) if risk to environment and public are protective."

Other significant barriers to SRS mission planning and accelerating cleanup are:

- Final decision for DOE nuclear material consolidation strategy and disposition paths.
- Load management of TRU waste
- Early initiation of SNF drying, poisoning and packaging facility to meet the 2011 initial shipping date to the Yucca Mountain Federal Repository.
- Early initiation of transportation load out facilities for SNF and HLW.

Recommended Congressional Action To Accelerate Cleanup

SRS recommends formal Congressional Authorization to provide perpetual federal ownership and responsibility for SRS's fixed boundaries.

Status of SRS EM PMP Baseline Validation

- Note that Guidance assumes that the "current cleanup plan" has a validated baseline (scope, schedule & cost) and all Variances will translate into an accelerated and less costly PMP.
- The SRS EM PMP is a Vision and does not have a validated technical baseline. The unvalidated PMP technical cost baseline significantly exceeds the current IPABS funding life cycle profile.
- The PMP and the associated SRS EM life cycle baseline in IPABS is being updated to address near term accelerated scope execution due to Contract Mod. #100 FY03-06, revised program planning assumptions and will address any "scope gaps" or new scope that is required for EM Completion.

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
1	<u>Alternate End State (RBES):</u> **Future Land Use and Exposure Scenario Modification.** Proposed Future Land Use and associated receptor exposure scenario is Maintenance – Long Term Stewardship for previous industrial operations areas with no planned industrial reuse.	<u>Scope</u>: **Exposure Scenario Modification.** SRS is currently in discussions with EPA Region IV and SCDHEC to establish and apply more appropriate exposure scenarios for selected areas of the site that are not planned to support any future mission. Justification for this modified receptor is that due to the lack of a mission, a maintenance or long-term stewardship worker will spend significantly less time at the unit, or in the area, than the day to day industrial worker. This modified exposure scenario will afford the three parties of the Federal Facilities Agreement (DOE, EPA, DHEC) less conservative, yet realistic, input parameters that are utilized to calculate risk, based on the hazards present. Therefore, the end state calculated cancer risk will remain consistent between current/planned and vision approaches (<10-6 residential and 10-4 to 10-6 worker with institutional controls); the change will be realized in the receptor specific inputs for the type of worker needed for the mission associated with the unit &/or area (e.g., industrial worker exposure = 2000 hrs/yr, while a maintenance/long term stewardship worker realizes 200 hrs/yr of exposure). It is assumed the scenario most likely to be applied for specific SRS facilities and/or areas without future missions will equate to an order of magnitude risk change that will be less conservative (i.e., if current industrial worker cancer risk calculates a 10-4 risk, then the vision maintenance worker risk will calculate a 10-5 risk). Current and Current Future Land Use is Industrial with No Residential. Variance proposes to revise Future Land Use as follows: • Continue Industrial: A,B,E-part, F-part, G, H and N • Maintenance-LTS: T,D,M,C, F-part, E-part, H-part, K,L,P,R,S,Z	**Regulatory Acceptance**. Approach deviates from routine/typical regulatory accepted methodology/protocol for evaluating risk. **Land Use.** Lack of binding/promulgated DOE land use policy for site.	Public and other stakeholders recommend Congressional Authorization to ensure perpetual federal ownership and LTS responsibility for SRS's fixed boundaries.

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
	Current Planned End State: Future Land Use is Industrial with NO Residential Land Use. Risk determination for Human receptors assumes and Industrial worker exposure scenario.			
		Cost: This potential variance is considered to be an ENABLER to accomplish the current 2025 EM Cleanup baseline. Cost and schedule impacts will be assessed after EM Cleanup baseline validation.		
		Schedule:		
		Risk:		

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
2	Alternate End State (RBES): **Area Risk Methodology and Protocols**	Scope: **Area Assessment.** Currently SRS addresses hazards on an individual basis; that is, each waste unit is characterized, assessed, and remediated as a single entity. There are at least twelve major heavy industrial areas at SRS. The industrial areas are generally fenced and contain buildings, pipelines, roads, railroads, and other industrial infrastructure. The areas generally range in the size from tens to hundreds of acres. These areas contain numerous waste units and facilities slated for decommissioning. There are obvious advantages in addressing the area as a whole, performing characterization and assessments collectively, potentially remediating groups of hazards at one time, and integrating the closure of D&D facilities in conjunction with SGCP facilities with subsequent deletion of substantial acreage from the National Priorities List. The FFA three parties are in the process of negotiating the details on the methodology to accomplish this and have called the approach the Area Record of Decision (ROD). It is anticipated the modified exposure scenario presented in the Exposure Scenario Modification subsection will be applied to entire areas as well as for individual hazards, dependent upon future mission. All SRS process/industrial areas are to be evaluated for Area assessment and Area RODs Area-wide Multimedia Environmental Model (Alternative Project) and Deactivation Risk Assessment Accelerated Closure. Scope: Currently, post-operational EM facilities are deactivated and assume a lower cost S&M mode prior to final decommissioning. A Risk Assessment (RA) is normally conducted subsequent to facility decommissioning. Without performing facility-specific risk assessments prior to initiation of facility deactivation, there is uncertainty regarding relative facility risk and the level of decontamination required to achieve the desired risk-based end states in an accelerated, environmentally safe, cost-effective manner. To "do it right the first time," reduce life cycle costs and accelerate completion of D&D activities, it is recommended that an Area-wide Multimedia Environmental Model (AMEM) first be used to identify and assess hazards and prioritize high risk facilities.	**Regulatory Acceptanc**e. Approach deviates from routine/typical regulatory accepted methodology/protocol for operable unit assessment and remediation. Only barrier is lack of agreed upon methodology and protocols which can be developed by the 3 parties. Flexibility in using appropriate exposure scenarios in risk assessment and cleanup decisions already exists. Modification is possible on a broader scale reflecting that many areas at SRS will have no industrial mission or activities in the future. Regulatory Acceptance of AMEM and RA methodology/protocol for evaluating risk and making cleanup decisions for final deactivation and	Public and other stakeholders recommend Congressional Authorization to ensure perpetual federal ownership and LTS responsibility for SRS's fixed boundaries. Release incremental funding for the approved Technology Development Acquisition Plan for An Alternative Approach to Environmental Assessment at Savannah River Site Environmental Multimedia Modeling. Seek early regulatory approval on proposed risk based approach and assessment methodologies, points and time of compliance, and risk-based end states. This **AMEM and** RA process has been well

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
		Then, prior to initiation of deactivation of the higher risk facilities, a RA would be performed on the higher-risk facilities to determine the level of deactivation cleanup required. This RA methodology would baseline the current facility hazard/risk status, identify hazards (constituents) of concern for selected points and times of compliance, and provide deactivation cleanup guideline levels necessary to achieve the desired deactivation and final decommissioning risk-based end states. This will support a risk-informed D&D decision and avoid future repetitive or additional D&D. Joint use of the AMEM and Risk Assessment methodology creates the potential for significant life-cycle cost savings by coupling various assessment tools to perform aggregate and facility-specific analyses within a given area to quickly assess risk (based on dose and excess lifetime cancer risk) and cost consequences. This will avoid costly D&D rework and maximize use of cleanup resources to mitigate the highest priority risks and hazards. This will also provide an opportunity for life cycle savings (or cost avoidance) due to the early elimination of risks during deactivation. This is consistent with EM's desire for an accelerated, cost-effective closure strategy based on comprehensive, technically defensible risk alternatives.	decommissioning.	received by the **DNFSB and** SRS CAB as an effective demonstration of initial planning for **final deactivation and decommissioning (**risk-based end state**)**.
	Current Planned End State:	Cost: This potential variance is considered to be an ENABLER to accomplish the current 2025 EM Cleanup baseline. Cost and schedule impacts will be assessed after EM Cleanup baseline validation.		
		Schedule:		
		Risk:		

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
3	Alternate End State (RBES): **Alternate Disposal for Pu-238 Contaminated Waste**	Scope: Waste contaminated with Pu-238 is planned to be characterized, repackaged, and shipped to WIPP. The Pu-238 is stored in many types of containers including large steel boxes, other boxes, 55 gallon drums, and boxes and drums inside of concrete culverts. Some of the Pu-238 waste is under soil cover. There are 3900 cubic meters containing 400,000 curies (0.4 million). The contamination control when opening containers with high concentrations of this material has been demonstrated to be difficult and will require modification of existing facilities or new facilities. The current shipping container (TRUPACT II) cannot ship these waste containers either due to size or high Pu-238 curie loading. The WIPP Land Withdrawl Act, EPA regulation 40CFR191 and DOE Order 435.1 allows an exception to the definition of TRU waste. Waste that DOE and EPA have determined does not need the degree of isolation required by the EPA regulation. The determination is based on an evaluation of a disposal concept including a performance assessment to demonstrate protection of human health and the environment. Through a Performance Assessment of near surface disposal it can be shown that groundwater protection, intruder, and public protection standards can be met. Disposal in near surface disposal would avoid a significant worker exposure issue because containers would not need to be opened. Also an ~ $180M total potential cost savings to EM ($48M to SRS EM) would be realized by disposal on-site vs. characterization, repackaging, and shipment to WIPP (not including the disposal costs at WIPP).	Political barrier of State of SC willingness to allow disposal of additional 400,000 curies of Pu (thousands, however, not millions). About 30% of the Pu-238 TRU waste volume (3700 cubic meters) is mixed waste and 70% is non-mixed waste. SCDHEC has regulatory authority over the mixed waste and their approval would be required to remove mixed waste labels based on SRS process knowledge justification. SCDHEC does not have regulatory authority over the ~70% that is not labeled as mixed.	
	Current Planned End State: All SRS TRU waste will be recovered and repackaged and shipped off site to WIPP National TRU Repository.	Cost: This potential variance is considered to be an ENABLER to accomplish the current 2025 EM Cleanup baseline. Cost and schedule impacts will be assessed after EM Cleanup baseline validation.		
		Schedule:		

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
		Risk: Significantly reduces Pu-238 exposure risk to workers by avoiding recovery and repackaging. Pu-238 is 100 times more difficult to manage than other forms of plutonium.		

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
4	Alternate End State (RBES): **In Situ Decommissioning in lieu of Demolition**	Scope: The 8-7-02 SRS EM PMP stops at deactivation for the Reactor and Canyon facilities and does not address decommissioning or in situ as a final end state for the Reactor and Canyon facilities. Alternate End State should include decommissioning and in situ disposal for the Reactor and Canyon facilities. In Situ decommissioning is ~50% less costly than demolition and risk assessments will identify this as a lower overall risk.		Public and Stakeholders recommend Congressional Authorization to ensure perpetual federal ownership and LTS responsibility for SRS's fixed boundaries.
	Current Planned End State: Decommissioning was limited to T, D & M Areas in the 8-7-02 SRS EM PMP.	Cost: This potential variance is considered to be an ENABLER to accomplish the current 2025 EM Cleanup baseline. Cost and schedule impacts will be assessed after EM Cleanup baseline validation.		
		Schedule:		
		Risk: Significantly reduces exposure risk to workers by avoiding demolition.		

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Variances and Recommendations				
ID No.	**Description of Variance**	**Impacts (in Terms of Scope, Cost, Schedule & Risk)**	**Barriers in Achieving RBES**	**Recommendations**
5	Alternate End State (RBES): **Revise "glass durability" Waste Acceptance Criteria to enable frit variations and increased HLW DWPF canister loading.**	Scope: Request Yucca to revise "glass durability" requirements to enable frit variations and increased canister loading. This would accelerate cleanup by requiring fewer canisters, but not impact the SRS End State.	Waste Acceptance Criteria is sensitive to NRC licensing process for Yucca Repository.	
	Current Planned End State:	Cost: This potential variance is considered to be an ENABLER to accomplish the current 2025 EM Cleanup baseline. Cost and schedule impacts will be assessed after EM Cleanup baseline validation.		
		Schedule:		
		Risk:		

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APPENDIX F

REGIONAL PLANNING INITIATIVES

Throughout the last ten years SRS has maintained a close relationship with planning groups, local governments, Council of Governments (COGs) and economic development organizations. Site planners have been active in sharing plans and planning techniques, providing tours and information -- and local planners have reciprocated. This close interaction has produced strong cooperation which has resulted in site and regional planners being current on each other's plans – thus eliminating the need for extensive education whenever new plans are created.

List of Planning and Development Organizations Contacted for the SRS RBES

South Carolina

- Aiken County Planning Department
- Aiken-Edgefield Economic Development Partnership
- City of Aiken Planning Department
- Lower Savannah Council of Governments (Responsible for planning for six counties in South Carolina – all within 70 miles of SRS - Aiken, Allendale, Bamberg, Barnwell, Calhoun, and Orangeburg counties)
- North Augusta Department of Economic Development
- Tri-County Alliance (Allendale, Barnwell and Bamberg counties)

Georgia

- Augusta-Metro Chamber of Commerce (Includes Columbia and Burke counties)
- Augusta-Richmond County Planning Department
- Central Savannah River Area Regional Development Center (supports 14 Georgia counties in the region – including those in the SRS vicinity – Augusta-Richmond, Burke and Columbia)
- Columbia County Planning Department

Based on~~From extensive~~ discussions and review of draft and final growth management, transportation and economic development plans, ~~SRS planners can say with assurance~~ it is reasonable to conclude that there are no major changes which would affect site missions in the next 20 years. While normal growth is expected in metropolitan counties in the region or in the populated regions of counties within or around SRS, the predominate land uses in the areas adjacent to SRS are expected to remain the same. The current major land uses on the border with SRS include:

Agriculture – while some livestock, horse farming and vegetable farming takes place, most of the land is used to produce forest products (for pulp and paper, telephone poles, pine straw)

Light industry - There is currently one 1,500 acre industrial park adjacent to SRS. Bordering this industrial center is the Chem-Nuclear Systems Low Level Radioactive Waste Disposal Facility, owned by Duratek. Also in close proximity, is the Plant Vogtle nuclear power facility, directly across the Savannah River from SRS. To ease the burden of the region, SRS has agreed to permit a solid waste landfill within its borders. This facility, the Three Rivers Landfill is operating under the authority of a fifty-year lease administered by the Lower Savannah Council of Governments.

Light residential – Most of housing on this land is associated with agriculture, however some houses and manufactured homes border the Site (consisting of small neighborhoods or individual homes).

Recreation – Because over 90% of SRS is not used for industrial purposes wildlife is plentiful. Because of this, extensive outdoor sports activities take place next to SRS. These activities include hunting, fishing, hiking and bird watching.

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APPENDIX G

REGULATORY SUPPORT AND AGREEMENTS

**Memorandum of Agreement for Achieving an
Accelerated Cleanup Vision
Savannah River Site**

On May 22, 2003, the Department of Energy -Savannah River Operations Office (SR), the U.S. Environmental Protection Agency-Region 4 (US EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC), known hereafter as "the Parties," agreed to support accelerated cleanup of the Savannah River Site (SRS). Building on this Letter of Support, the Parties hereby agree to the following implementing principles and concepts.

1. The Parties are committed to work together to develop a Comprehensive Cleanup Plan (CCP) to achieve an earlier end date for the environmental restoration and facility decommissioning at SRS. The CCP will represent an accelerated cleanup program that has a clear objective to reduce risks to workers, the public and the environment. For the purposes of the environmental restoration program, the CCP will become the basis to the Federal Facility Agreement (FFA) Appendices D and E and their annual submissions. The CCP will demonstrate the SR's commitment to maintain a level of cleanup work consistent with the intent of the letter from V. L. Weeks, US EPA, to L. C. Goidell, SR, dated August 16, 1993, Subject: Fiscal Year 1993 Through 2006 Commitments, Federal Facility Agreement.
2. The Parties agree that the CCP will support the Target and Vision cleanup objectives, which are closing whole areas earlier, leading to earlier completion of the entire cleanup program. This Memorandum of Agreement (MOA) sets forth principles for accelerating SRS cleanup, beyond the objectives of the SRS Environmental Management Program Performance Management Plan (PMP). SRS will reduce its operations footprint to establish a buffer zone at the perimeter of the Site, while the central area of the Site will be reserved for continuing or future long-term operations. The Parties agree that establishing this buffer zone and appropriately sequencing environmental restoration and decommissioning activities can lead to early closure of areas. This will enable the Parties to prioritize areas for closure and determine areas of the SRS that will be candidates for deletion from the National Priorities List (NPL).

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**Memorandum of Agreement for Achieving an
Accelerated Cleanup Vision
Savannah River Site**

3. The completion of the SRS environmental cleanup program will be achieved through the completion of areas within watersheds, followed by the Integrator Operable Units (IOUs), and concluding with the Savannah River and Flood Plain Swamp IOU. The principle of area closure is to determine that areas are completed when all required response actions are completed. The specific site area scoping assumptions will be established by the respective core team, in support of the CCP development. As an area is completed, the Parties endorse the application for partial deletion of the respective area from the NPL. The goal is to delete all areas of the SRS from the NPL, as depicted in the attached conceptual chart (Attachment 1).

4. Decommissioning will be conducted consistent with the attached administrative flow path, which demonstrates integration with the FFA process (Attachment 2).

5. The completion of an area will be documented in an Area Record of Decision (ROD) as described in item 3 above. To achieve Area RODs, decommissioning and environmental restoration work will be sequenced and conducted such that the Area ROD schedules will be met. Annually, SRS will provide a decommissioning schedule that supports meeting the Area ROD schedule.

6. The Parties agree that the concept of Area RODs is an appropriate tool for the re-sequencing of the FFA program to support area closure as the accelerated end date is being achieved. To the maximum extent practicable, entire areas of the SRS (e.g., a facility area such as TNX) will be addressed as a consolidated unit to take advantage of characterization data, risk assessment, and integrated solutions that consolidate areas into an expanded operable unit to effect economies of scale and reduce administrative requirements.

7. The Parties recognize that to effect an accelerated end date for the program, individual operable units or aggregations of operable units that comprise the program will need to be assessed and the remedies selected and implemented in an expeditious manner.

8. To reduce the time to assess, select remedies, and implement remedial actions, the Parties commit to continually seek, develop, and use innovative technologies, processes, presumptive remedies, and other approaches. These actions will yield shorter schedules and cost-effective cleanup responses appropriate to the risks and with a bias for action. The Parties recognize that substantial onsite technical capabilities exist and will be leveraged to support accelerated cleanup.

9. The CCP metrics, to monitor progress, will be developed and mutually agreed to by the Parties. The Parties recognize that meeting or exceeding the CCP schedule may be jeopardized if resource limitations arise; therefore, prioritizing appropriate or additional resources is critical to achieving cleanup acceleration.

10. The Parties recognize that accelerating the SRS cleanup program and achieving area closure will require active involvement and/or direction from all levels within each of the Parties. The Parties agree to establish and support core teams to achieve the goal of cleanup completion.

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Memorandum of Agreement for Achieving an Accelerated Cleanup Vision Savannah River Site

11. The Parties endorse the *Principles of Environmental Restoration* as set forth below, and commit to core team scoping and decision processes that utilize technical protocols for the performance of work and document templates for the reporting of the decisions.

12. The Parties recognize that this is an evolving process and changes may be required. This Agreement does not alter the Parties' obligations under the SRS FFA, which will remain fully operative under its existing terms unless and until the FFA is duly modified in accord with the process it contains for modification.

Principles of Environmental Restoration
1. Building an effective core team is essential.
2. Clear, concise, and accurate problem identification and definition are critical.
3. Early identification of likely response actions is possible, prudent, and necessary.
4. Uncertainties are inherent and will always need to be managed.

The following endorse this Memorandum of Agreement:

R. Lewis Shaw 6/23/03

R. Lewis Shaw, Deputy Commissioner for Environmental Quality Control
South Carolina Department of Health and Environmental Control
Date

J. Palmer 7/8/03

J. I. Palmer, Jr., Regional Administrator
U.S. Environmental Protection Agency – Region 4
Date

Jeffrey M. Allison 6/19/03

Jeffrey M. Allison, Manager
Savannah River Operations Office
U. S. Department of Energy
Date

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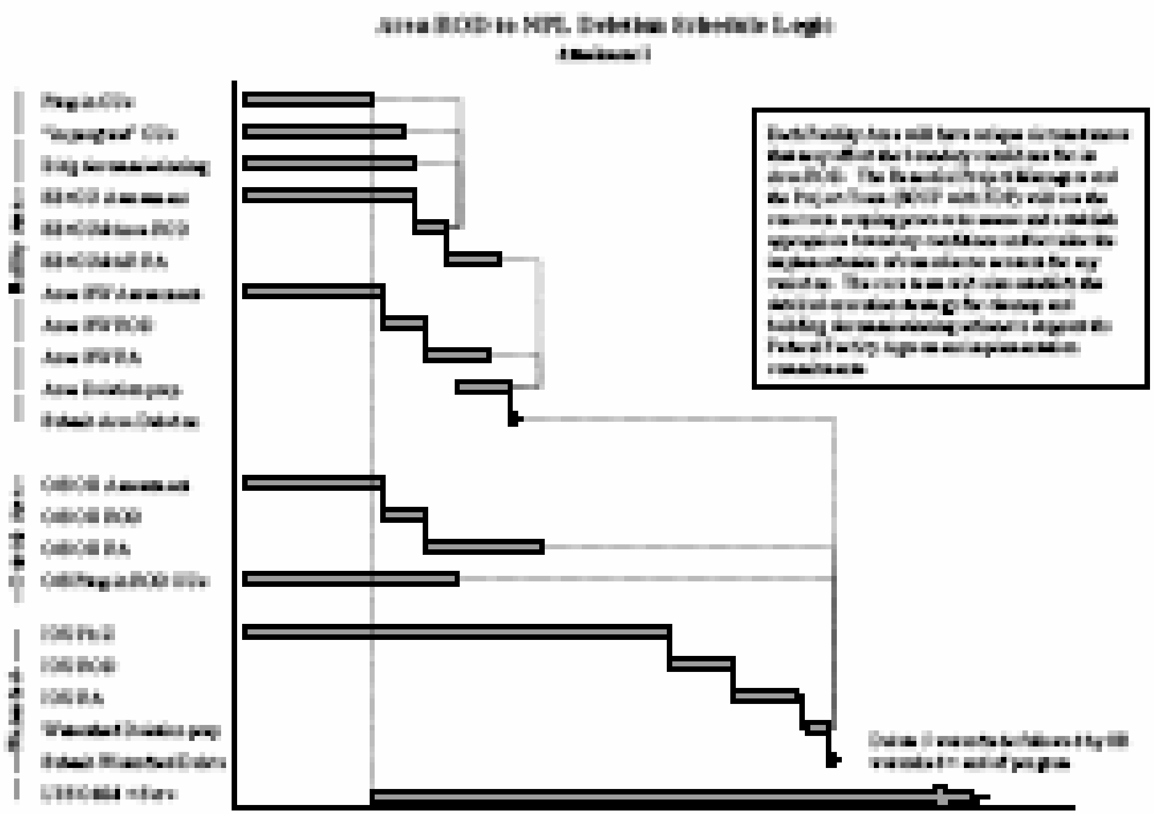

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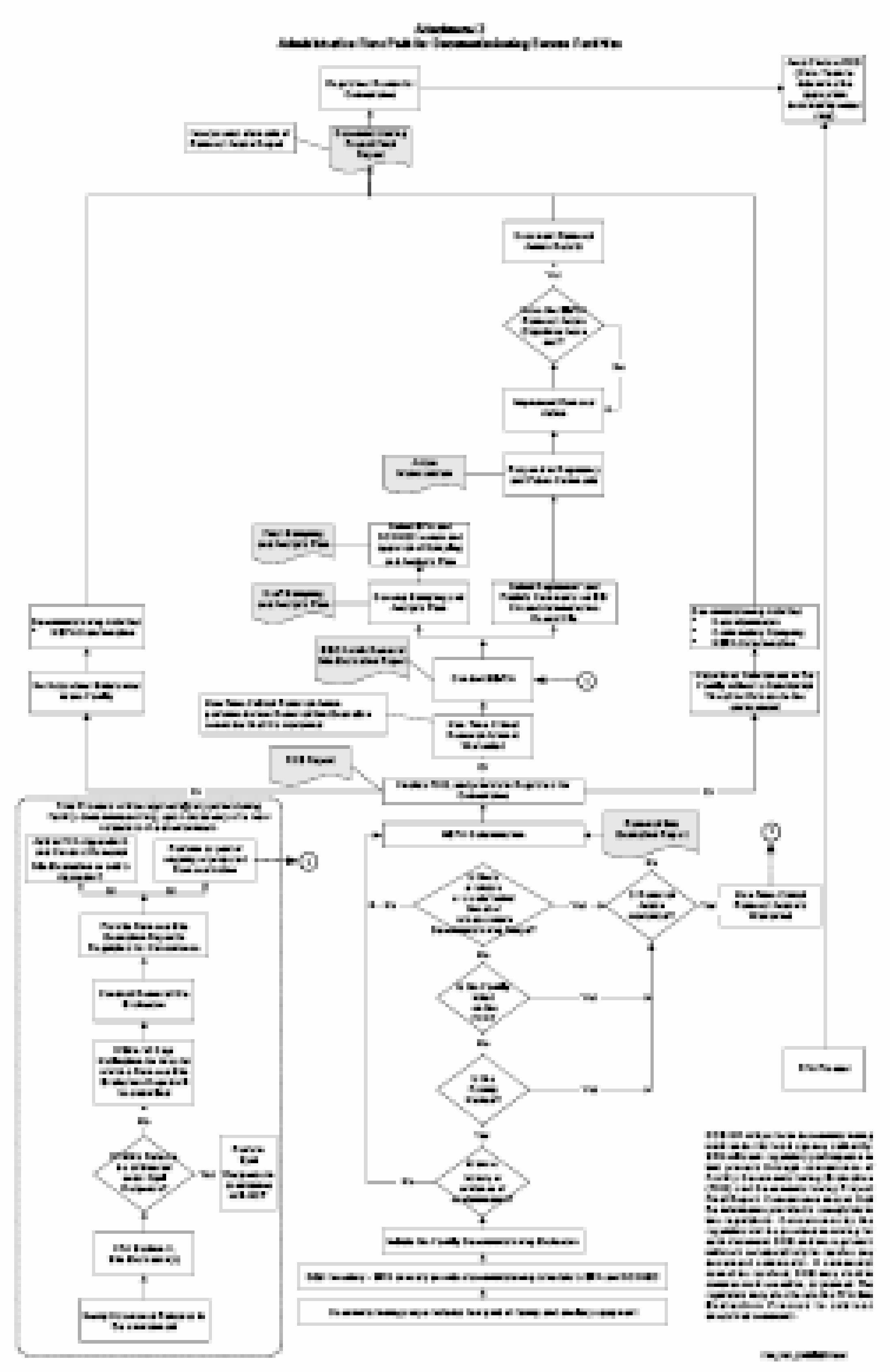

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**LETTER OF SUPPORT FOR ACCELERATING CLEANUP
AT THE SAVANNAH RIVER SITE
May 22, 2003**

Among the South Carolina Department of Health and Environmental Control (SCDHEC), the United States Environmental Protection Agency (EPA), and the United States Department of Energy (DOE) ("the Parties")

Foundation

In a Letter of Intent, dated May 8, 2002, the Parties established a foundation for accelerating cleanup at the Savannah River Site (SRS), and continue to recognize that foundation.

The Parties agreed that accelerating the reduction of risk and cleanup, in a cost-effective manner, is in the interest of the Parties, and the people of South Carolina and the region.

The Parties shared a vision for Environmental Management (EM) activities at SRS to accelerate completion of all cleanup by 2025.

The Parties have built a cooperative and effective relationship and base of success. The efforts contemplated herein will build on that success to mutual benefit, improving on the performance of a strong program. Such a commitment, including funding necessary to sustain the accelerated cleanup objectives, provides a truly significant opportunity to accelerate risk reduction and site cleanup.

The Parties agree that all activities will reflect the respective responsibilities of each, and will be done in compliance with applicable laws and regulations.

The Parties continue to value the importance of enforceable commitments to sustain progress.

The Parties agree, in setting priorities and cleanup strategies, to recognize, consider and include the principle of addressing greatest risks first, balanced by risk to workers, the public, and the environment.

Principles

Within the context of the above foundation, the Parties agree to:

- Support risk-based decision-making.

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- Support accomplishment of Performance Management Plan (PMP) initiatives with the exception of those initiatives affected by ongoing federal litigation. The Parties are committed to the overall goals and objectives of the PMP, and will strive to make significant progress in PMP implementation recognizing that difficult policy and regulatory issues may arise. We will continue to seek opportunities that build on our mutual successes within the applicable laws, regulations, and agreements.

- Support EM accelerated cleanup beyond PMP initiatives. Through numerous productive collaborations and working sessions at all levels, EPA, SCDHEC and DOE are actively identifying opportunities for fulfilling their SRS Federal Facility Agreement and Site Treatment Plan obligations by using more efficient methods, leading to accelerated cleanup of the Site.

Jessie Hill Roberson, Assistant Secretary
for Environmental Management
U.S. Department of Energy

Jeffrey M. Allison, Manager
Savannah River Operations Office
U.S. Department of Energy

R. Lewis Shaw, Deputy Commissioner
for Environmental Quality Control
South Carolina Department of Health
and Environmental Control

J. I. Palmer, Jr., Regional Administrator
U.S. Environmental Protection Agency
Region 4

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ATTACHMENT

This Letter of Support satisfies compliance with Section 315 of Public Law 108-7 (Omnibus Appropriations Act for FY 2003).

Jessie Hill Roberson, Assistant Secretary
for Environmental Management
U.S. Department of Energy

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nited States Government Department of Energy

memorandum

DATE: May 22, 2003

REPLY TO
ATTN OF: EM-1

SUBJECT: Release of Fiscal Year (FY) 2003 Funding for Obligation

TO: Jeffrey M. Allison, Manager, Savannah River Operations Office

On March 21, 2003, in a funding allocation memorandum to you, I imposed a limitation on the level of FY 2003 obligations that could be incurred by the Savannah River Operations Office (SR) in the Environmental Management Program. That limitation of $52,466,000 was imposed because of the absence of any documentation demonstrating regulatory endorsement of the SR Performance Management Plan.

In the interim period of time, SR has worked productively with both Federal and State regulators to establish an agreed to foundation for accelerating cleanup at the Savannah River Site (SRS) as evidenced in the May 22, 2003, Letter of Endorsement for Accelerating Cleanup at the SRS.

In my judgment, the referenced letter of endorsement satisfies the restrictive condition set forth by me in the March 21, 2003, funding allocation memorandum; accordingly, the imposed limitation is removed and SR can proceed with necessary actions to obligate the $52,466,000.

Jessie Hill Roberson
Assistant Secretary for
Environmental Management

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APPENDIX H

LONG TERM STEWARDSHIP

This appendix describes the national and Savannah River Site (SRS) perspectives on long-term stewardship.

NATIONAL PERSPECTIVE ON LONG TERM STEWARDSHIP

Long Term Stewardship Report to Congress

In January 2001, the Department of Energy (DOE) published *A Report to Congress on Long-Term Stewardship*, containing the most comprehensive analysis to date of the DOE's existing and anticipated long-term stewardship obligations at DOE sites. The request for this report in the FY2000 National Defense Authorization Act (NDAA) reflects a continuing Congressional interest in long-term stewardship costs and management and demonstration of the degree of success achieved by nearly $60 billion of environmental management funding.

The report identifies the long-term stewardship activities anticipated by DOE at as many as 129 sites by the year 2006. DOE already performs long-term stewardship activities at 34 sites that have been cleaned up and closed. While the primary focus of the report is on the anticipated scope, schedule, and cost for long-term stewardship activities from 2001 through the year 2006, the report also provides a preliminary glimpse of what DOE's long-term stewardship obligations may be post 2006.

There have been many interpretations of the term "long-term stewardship." Therefore, in the report, DOE defined long-term stewardship as follows:

> *all activities necessary to ensure protection of human health and the environment following completion of cleanup, disposal, or stabilization at a site or a portion of a site. Long-term stewardship includes all engineered and institutional controls designed to contain or to prevent exposure to residual contamination and waste, such as surveillance activities, record-keeping activities, inspections, groundwater monitoring, ongoing pump and treat activities, cap repair, maintenance of entombed buildings or facilities, maintenance of other barriers and containment structures, access control, and posting signs. ("Developing the Report to Congress on Long-Term Stewardship", June 2001.)*

DOE's *Report to Congress on Long-Term Stewardship* reemphasizes DOE's commitment to long-term stewardship. The report recognizes:

- DOE has been and intends to continue performing cleanup to standards that do not allow for unrestrictive land use;
- Even if unrestricted land use were to be sought, it is often technically and economically infeasible;
- Consequently, long-term stewardship will be required for many years into the future; and
- Given the need for long-term stewardship to ensure the continued effectiveness of cleanup work, DOE intends to establish reliable management plans to carry out the long-term stewardship mission.

This report also emphasizes the role and responsibility of the DOE landlord function with respect to long term stewardship activities. The policy directs the landlord program Secretarial Officers to be responsible for conducting the long term stewardship program at their sites, unless other arrangements are made. The policy objective is to initiate actions which will lead facility managers to plan, budget, and transition long term stewardship activities in a timely manner.

Office of Legacy Management

In FY2004 DOE requested and Congress approved a change in the management of long-term stewardship responsibility for DOE closure sites by creating the Office of Legacy Management (OLM) within DOE. The mission of the OLM is to manage the Department's post-closure responsibilities and ensure the future protection of human health and the environment. The OLM has control and custody for legacy land, structures and facilities and is responsible for maintaining them. As currently defined by Congress, this applies to closure sites. The January 2001 *Long Term Stewardship Congressional Report* assigns long term stewardship to site landlords for non-closure sites.

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Environmental Management (EM) Completion

As part of DOE's continuing efforts to accelerate cleanup and follow-up actions from the EM Top-to-Bottom Review, a special EM-1 focus team developed and issued a definition of completion. (Definition of Environmental Management Completion Memo, Jessie Roberson to EM Field Office Managers, February 12, 2003.) SRS validated that these definitions were incorporated in the contractor's baseline

Institutional Controls

In April 2003 DOE issued its *Use of Institutional Controls Policy* (DOE P 454.1). This policy delineates how the Department, including the National Nuclear Security Administration, will use institutional controls in the management of resources, facilities, and properties under its control and to implement its programmatic responsibilities.

This policy is particularly significant to SRS regulators because it re-emphasizes DOE's commitment to perpetually maintaining institutional controls and seeks sufficient funds to do so. The policy states, "DOE will maintain the institutional controls as long as necessary to perform their intended protective purposes and seek sufficient funds." (DOE Policy P 454.1, Use of Institutional Controls, April 9, 2003.)

DOE uses a wide range of institutional controls as part of efforts to:

- appropriately limit access to, or uses of, land, facilities, and other real and personal properties;
- protect the environment (including cultural and natural resources);
- maintain the physical safety and security of DOE facilities; and
- prevent or limit inadvertent human and environmental exposure to residual contaminants and other hazards.

The policy states:

In situations where unrestricted use or unrestricted release of property is not desirable, practical, or possible, institutional controls are necessary and important to DOE efforts to fulfill its programmatic responsibilities to protect human health and the environment (including natural and cultural resources). It is DOE policy to use institutional controls as essential components of a defense-in-depth strategy that uses multiple, relatively independent layers of safety to protect human health and the environment (including natural and cultural resources). This strategy uses a graded approach to attain a level of protection appropriate to the risks involved. DOE will use a graded approach to determine what types and levels of protective measures (e.g., physical, administrative, etc.) should be used.

SRS PERSPECTIVES ON LONG TERM STEWARDSHIP

The SRS cleanup program has already accomplished significant risk reduction, but the "to-go" cleanup program to complete the task is also significant. As a result of DOE-WSRC contract modifications in 2003, 1013 EM facilities were identified as candidates for decommissioning. Of these 144 are considered nuclear facilities, 38 are considered radiological facilities, and 780 are considered industrial facilities. The 1013 facilities also include 51 high-level waste tanks, two of which are closed. Twenty five facilities were decommissioned in FY03. In addition to the facilities, there are 515 waste units identified, of which, over 300 have been classified as either remediated or as requiring no further action.

All EM decommissioning activities are being integrated with soils and groundwater regulatory closure activities. Contamination in the foundations will be removed to a level that does not create an additional waste unit. The plan is to implement Area Closure Records of Decision, which will include remediation and deactivation and decommissioning. These areas will be deleted from the National Priority List of Superfund sites.

In August 1999, Department of Energy – Savannah River (DOE-SR), Environmental Protection Agency (EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) signed a Memorandum of Agreement that establishes the *Land Use Control Assurance Plan* (LUCAP), which effectively establishes and implements procedures to assure the long-term effectiveness of Land Use Controls (LUCs) consistent with regulatory cleanup in the *Federal Facility Agreement* for SRS. For every Record of Decision (ROD) that requires land use controls, the LUCAP is updated with a ROD-specific LUC implementation plan that defines the institutional controls and long-term stewardship requirements. Annually, the DOE-SR Manager certifies that the Land Use Controls are being maintained.

The process of identifying all the detailed requirements for long term stewardship activities anticipated for the site is ongoing. This appendix provides the general framework for the long-term stewardship process at SRS.

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APPENDIX I

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